

MACHINE AND TOOL
ENGINEERING

The

DECEMBER, 1943

TOOL ENGINEER

*Official Publication of
American Society of Tool Engineers*

How to Plan for
MASS PRODUCTION
PAGE 85

The Allison Engine:
Cooling and Design
Surface Finishes
PAGE 90

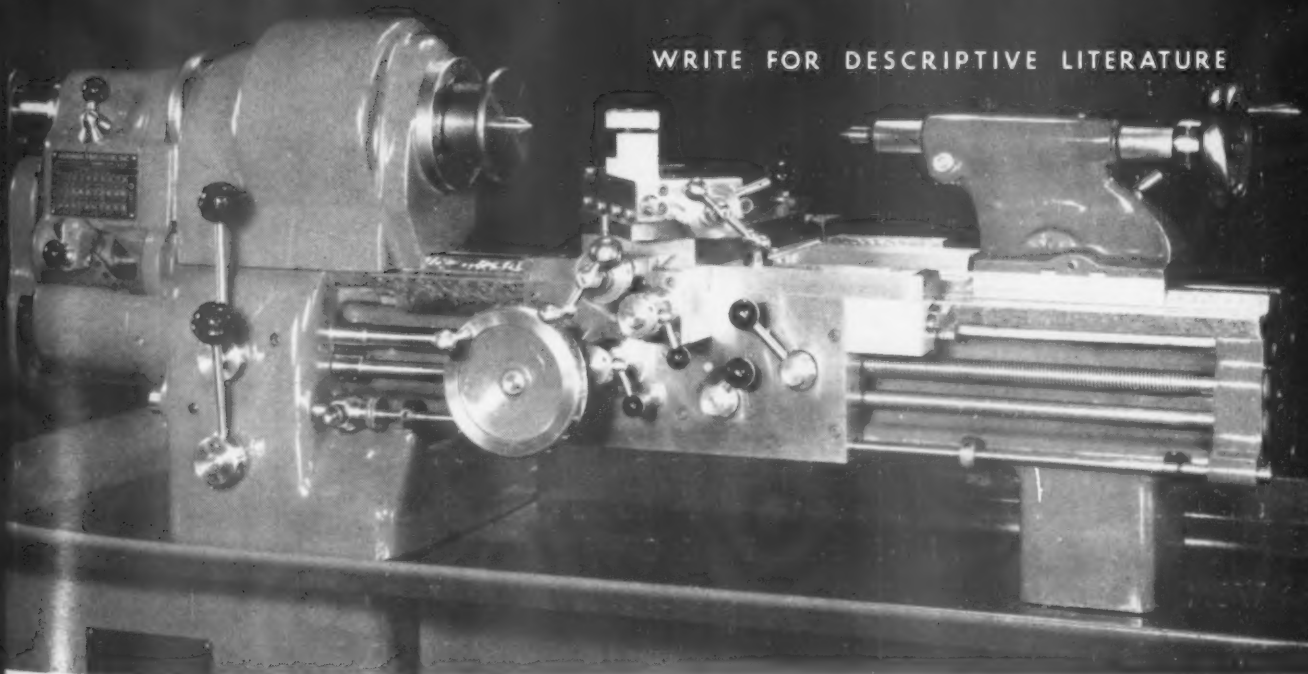
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INDUCTION HEATING?
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News Review
PAGE 118



Performance has established
Leadership for HARDINGE
High Speed Precision
Tool Room Lathes

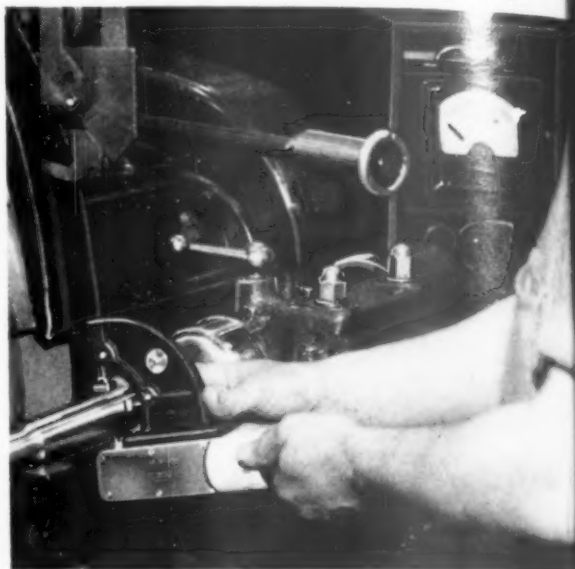
WRITE FOR DESCRIPTIVE LITERATURE



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A's EASY-TO-USE as a snap gage ... *But with Electrolimit Accuracy*

YOUR operators can check right down to the fourth place after the decimal...fast, positively, *easily*... with the Pratt & Whitney Electrolimit Snap Gage. This is the portable version of the famous P&W Electrolimit Gage, flexibly mounted for use where it's easier to take the gage to the work than to take the work to the gage. Set with a master, they register variations from the established zero with easily-read magnifications up to 20,000 times. No possibility of "feel" errors... these are snap gages *plus* geared to present and future inspection requirements.



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Increased production capacity now lets Pratt & Whitney promise *far better deliveries* than you'd expect. Place priority-rated orders *now*... you'll have Electrolimit Snap Gages in time to give a big boost to the jobs you have *already started*. Full details on request. Address our nearest branch office, or contact our headquarters... Pratt & Whitney, Division Niles-Bement-Pond Company, West Hartford, Conn.



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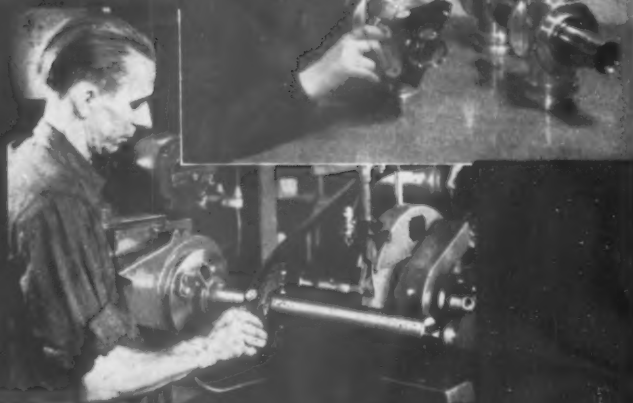


There is no better paying investment than the right tools for the job.



Dial Snap Gage

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as a Bench Comparator
but **FAST**
and **PORTABLE!**



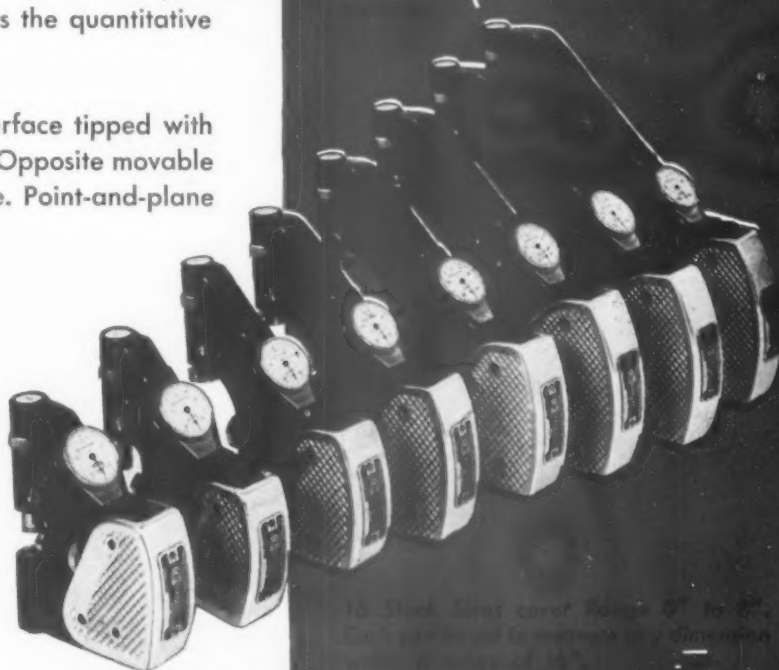
HERE'S A GAGE that combines PORTABILITY with speed in use and absolute accuracy on dimensions as fine as .0001". STANDARD Dial Snap Gage is portable and easy to handle as a conventional snap gage, yet has the quantitative accuracy of a stationary instrument.

Adjustable gaging pin has a serrated flat surface tipped with tungsten carbide that practically defies wear. Opposite movable pin has mushroom top, also tungsten carbide. Point-and-plane construction assures continued, accurate readings whether instrument is set by cylindrical or flat standards.

STANDARD Dial Snap Gages speed inspection, guard against rejects and material spoilage and eliminate human variations not only on precision work but also where tolerances are comparatively liberal. Write for Special Bulletin.

FEATURES

1. High precision indicator approximately 1" in diameter graduated .0001". Bezel rotates for convenient setting.
2. Measuring anvil tipped with tungsten carbide. Indicator protected against shock by sudden applications to measuring pin.
3. Tungsten carbide tipped adjustable anvil has flat lapped serrated surface. Minute chips and dust readily clear from it, helping insure accuracy.
4. Adjustable, spring-cushioned safety stop reduces jar, helps hold work in correct gaging position.
5. Air space between grip and body of instrument protects against hand heat, further safeguards accuracy.



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Each gage has a 12 inch wide body dimension
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THE PUBLICATION OF MACHINE AND TOOL ENGINEERING

THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BOULEVARD DETROIT 2, MICHIGAN

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Publisher's Letter

OUR editors appreciate indications that THE TOOL ENGINEER is practical and read by important production engineers. A case in point is the reader in an eastern city upon whom Editor Jerome Wilford recently called.

This reader told Jerry that as a result of reading an article on a new forming method, in our October, 1943, issue, he planned to install in his plant a system that would "save thousands of dollars before the end of the year." Such comments help keep us on the editorial beam.

Since I last wrote this letter to you, I've been around the country discussing the post-war machine tool market outlook with users and builders.

One school of thought feels that standard machine tools, such as lathes and milling machines, will have a tough row to hoe. Others,

who are builders of special machine tools, are rather optimistic.

One machine tool builder I talked with was highly pleased with an export order he has received which "will keep us going for 16 months."

If the machine tool industry isn't renegotiated out of business, the picture is not too bad thinks another machinery man. It takes a lot of money to develop new models, refine designs and test new machines before they are introduced to the trade, and the government must leave the builder enough capital to accomplish these things, he explained. By the way, have you read our page on "Machine Tools", a regular feature we're carrying every issue now? Turn to page 110.

I'm inclined to think things are not so bad as they seem—for instance, I heard of a new milling method that may revolutionize cur-

rent conceptions of milling. It may even obsolete millions of dollars worth of milling machine equipment in plants throughout the world.

Watch for a description of this new technique in an early issue.

Had the pleasure of a two hour breakfast with Major DeSeversky recently. He visualizes mass production of safe aircraft for the masses with cruising speeds of 250 miles per hour and up; people living far from their employment; the U. S. as the aircraft producer for the world; quantity civilian aircraft production soon after the war . . .

Provocative, to say the least!

And now, sincere greetings of the season to you.

Roy T. Bramson

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MEMBER



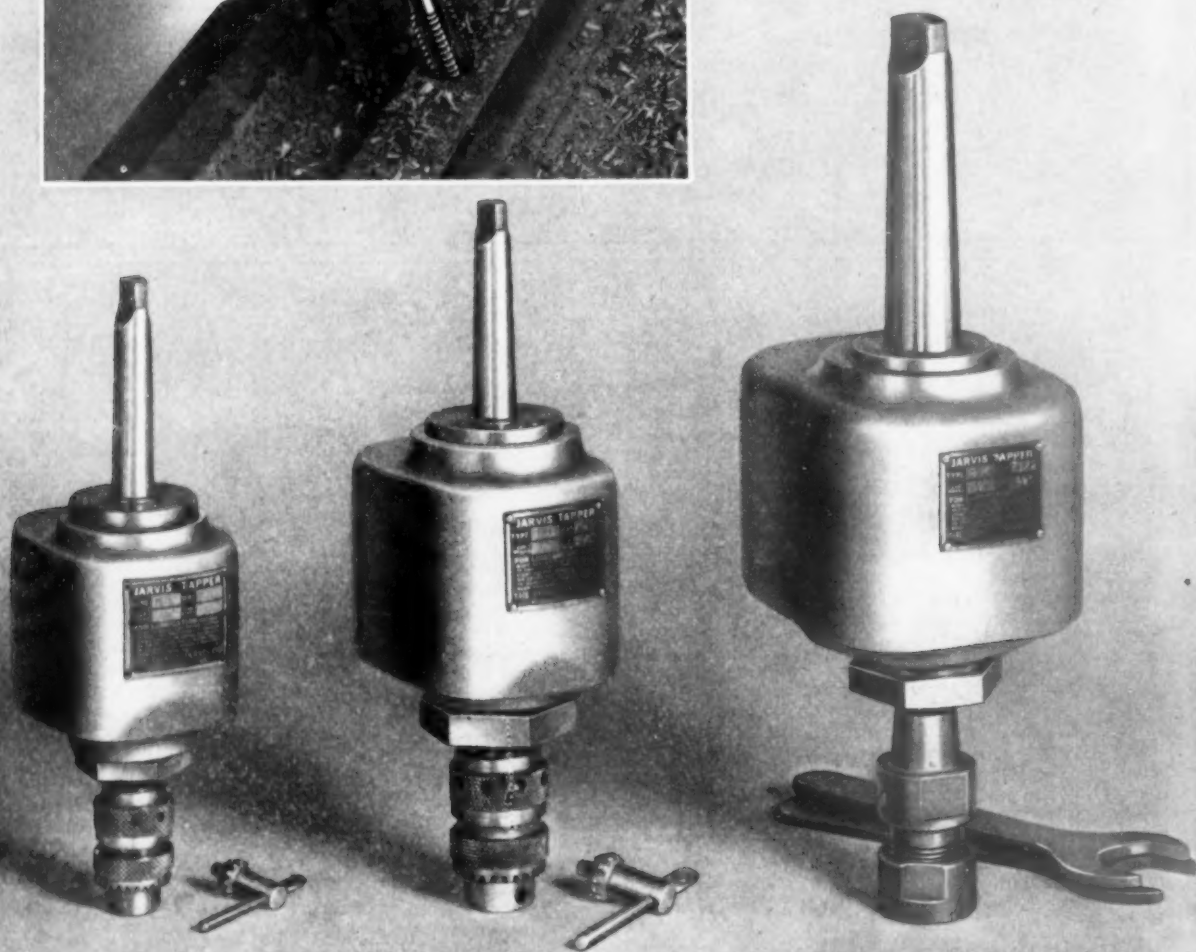
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"We have found the Center Scope purchased from you several months ago, to be a very valuable addition to our tool room equipment.

"We have cut our jig boring time at least 25% which has avoided the necessity for sending any boring to outside shops.

"By having the bench men lay out their jigs and dies with a height gage or Johannsen Blocks and turning the job over to the boring mill hands, we have maintained closer limits on spacing and eliminated mistakes entirely.

"Spacing within .001 are easily attained and closer tolerances are possible.

"The tool makers are all enthused about this instrument and join in our recommendation of it."

Yours for Victory!

NORGE DIVISION
Borg-Warner Corporation

G. P. Kennedy
Chief Tool Engineer

Speeds Locating ...Makes Accuracy a Habit!

BETTER work at lower costs — is the universal report from shops using Center Scope, the optical locating tool. Job time estimates are being reduced, because Center Scope makes locating time shorter and gets more work out of each machine tool, from bench drill to lathe or jig borer.

Center Scope can be used without technical knowledge or training, and produces accuracy

of plus or minus .0001" or better, the first time an operator uses it.

Used on any machine tool, it is a precision instrument, not affected by wear, temperature, or mechanical pressure.

Prices are attractive, too. Variable Center Scope, only \$97 f.o.b. Milwaukee; Edge Block, \$23 additional. For full information, write for Bulletin No. CS301.

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Autometric
Jig Borers

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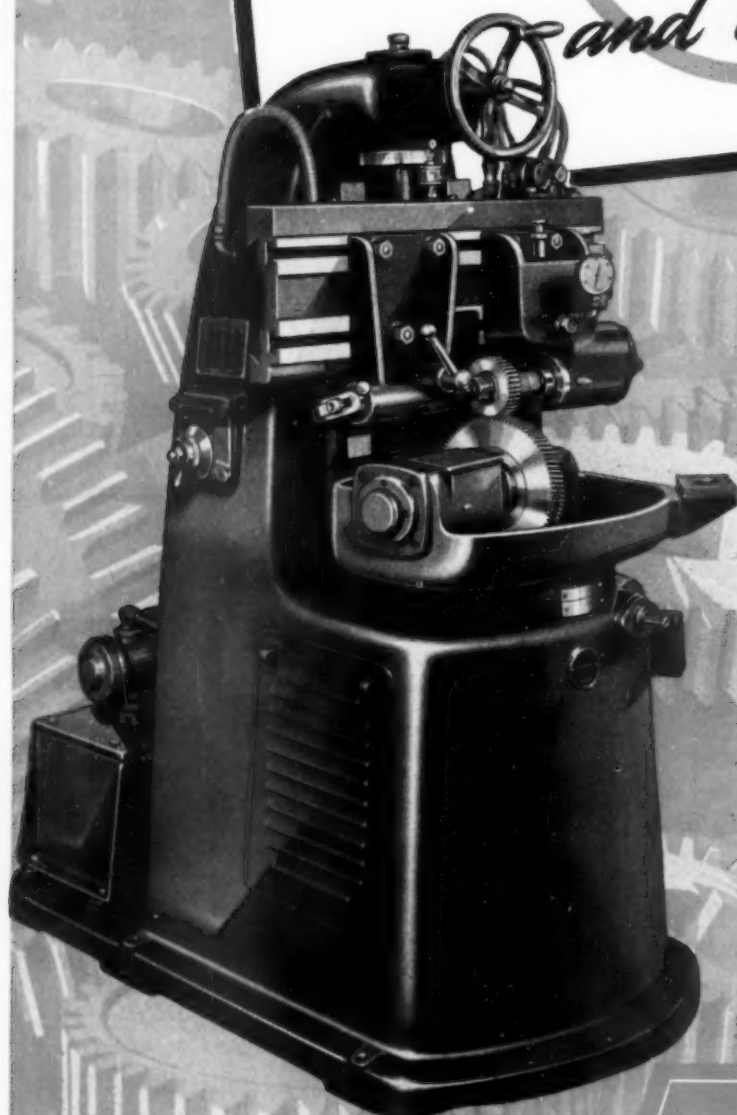
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*is Fast, Accurate
and Economical*



When gear specifications require lapping, or in cases where fire distortion errors are encountered, the RED RING Crossed Axes Rotary Lapping process will be found outstanding in effectiveness, speed and economy. Lapping by this process acts on the tooth surface in two directions simultaneously and over the entire surface with uniform intensity.

RED RING lapping is applicable to spur gears, helical gears, cluster and shoulder gears. Either the cramp action or power tailstock process is available for high or low involute teeth and ELLIPTOID teeth.

The RED RING Gear Lapping Machine is fully automatic and adjustable and therefore does not require a skilled operator. The time cycle may be set so that more stock may be removed from one side of the teeth than the other.

Write for descriptive bulletin.

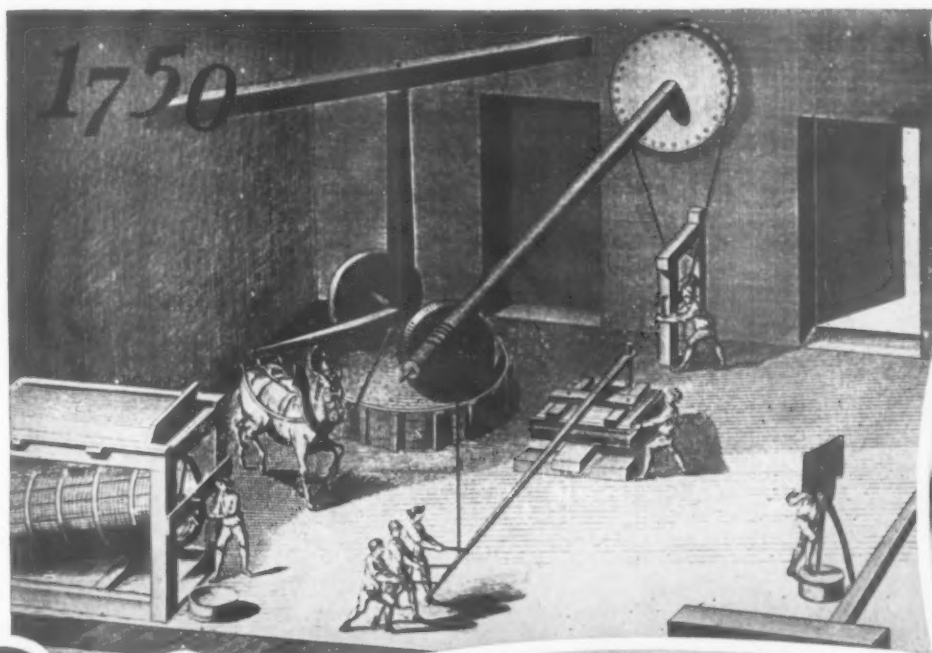
**SPECIALISTS ON SPUR AND HELICAL
INVOLUTE GEAR PRACTICE**

**ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORMS**

**NATIONAL BROACH
AND MACHINE CO.**

RED RING PRODUCTS
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Just imagine production then



Bettmann Archive

THE view above, taken from the French Encyclopedia, shows various motive powers employed in a metal making establishment in France during the 18th Century. At the right men are operating a giant metal cutter. At the left, a grinding device is operated by a combination of men and horse power. Compared by the standards of today, there just was no such thing as production. And, what is the greatest single improvement over those old methods? Perhaps it is the advancement of air and

hydraulics . . . the applying of air and hydraulic pressure for the operation of chucks, work holding and ejecting devices, assembling presses and many other air and hydraulically operated labor-saving devices. "LOGAN" Air and Hydraulic Equipment has solved production problems and speeded up manufacturing in most of America's largest industrial plants. Let "LOGAN" Engineers make recommendations on modernizing equipment in your plant by the application of Air and Hydraulic equipment.

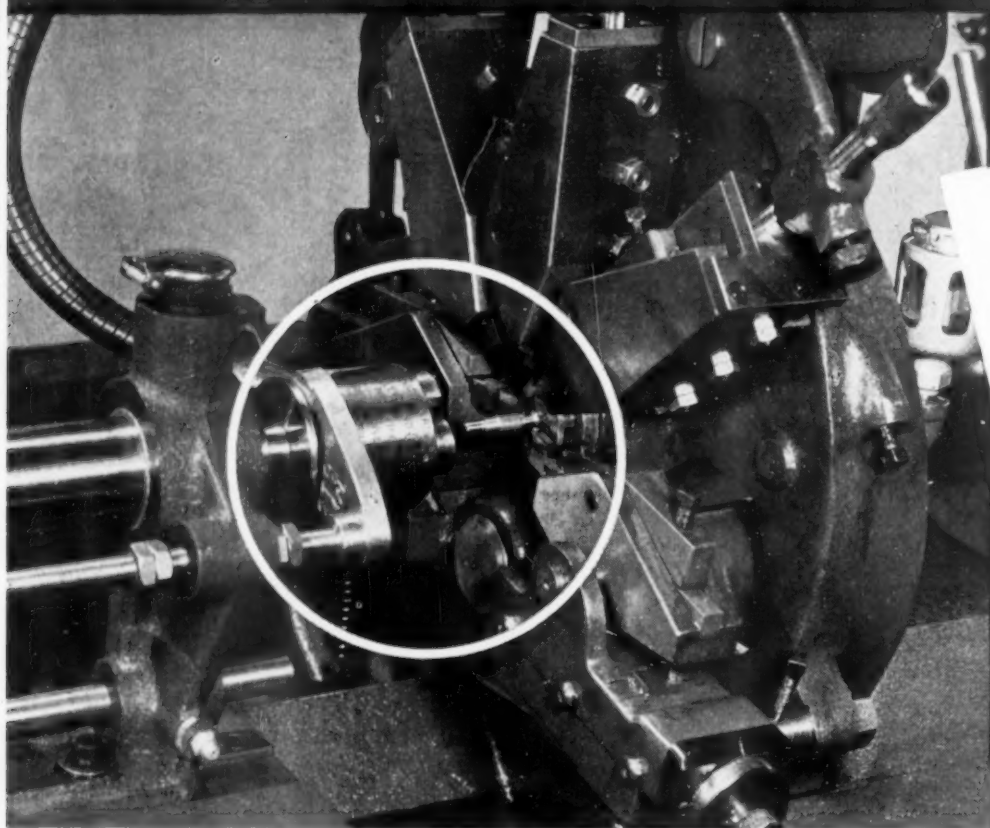
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For PRECISION THREADS On Small Parts



Namco Revolving Die Heads
with Circular Chasers
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If you are doing small work that demands speed, production and precise dimensions, you can depend on Namco Circular Chaser Die Heads for "toolroom accuracy" at high production output. Class 3 threads, too, without variation.

They save time, because all four chasers are adjusted simultaneously. Inserting a reground duplicate set is a 2-minute job—no trying for size, no work spoilage, less idle machine time—and precise dimensions maintained.

They cost less, because chasers may be reground through 270° of circumference—last 10 to 50 times longer.

Namco Circular Chaser $\frac{5}{16}$ " Die Heads are available for many makes of automatic screw machines for making small parts.



Maximum Capacity Type DR $\frac{5}{16}$ "
Complete data in Catalog D-42

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ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

10 to 20 TIMES LONGER LIFE

After 2 months Equal Service in identical machines—Which of these 2 SLEEVES would YOU depend on for ACCURACY?



THE SLEEVE illustrated on the left is an ordinary soft steel sleeve; the one on the right is a Midwest Hardened and Ground Sleeve. Because Midwest Sleeves are scientifically hardened and precision ground, their length of accurate life is from ten to twenty times longer than ordinary sleeves. The hardened surfaces do not easily mar or chip through handling and use, permanent taper concentricity is maintained. Where these Midwest Sleeves are used in drill presses or milling machines, the tools placed in them are held in accurate alignment. Drill breakages are reduced, spoiled production is avoided.

Furthermore, the conservation of steel and getting the utmost out of cutting tools are highly important matters at the present time. The longer life of Midwest Sleeves saves vital steels—the steels that would otherwise be consumed through repeated identical replacements of soft steel sleeves which quickly become worn, marred and discarded.

PROMPT DELIVERY IN MANY SIZES CAN BE MADE FROM STOCK

MIDWEST MILLING CUTTERS • SLEEVES
COUNTER BORES • END MILLS
REAMERS • SPECIAL TOOLS • FORM TOOLS
CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

MIDWEST TOOL & MFG. CO., 2364 W. JEFFERSON AVE., DETROIT, MICH.

DECEMBER, 1943

TURRET HOLDER TYPE
Style No. 353—Straight Sleeves
with Morse Taper Holes

TANG END TYPE

Style No. 350—Morse Taper Sleeves with Morse Taper Holes
Style No. 351—B. & S. Taper Sleeves with B. & S. Holes
Style No. 356—Morse Taper Sleeves with B. & S. Taper Holes
Style No. 358—B. & S. Taper Sleeves with Morse Taper Holes

TAPPED END FOR DRAW BAR

Style No. 352—B. & S. Taper Sleeves with B. & S. Taper Holes
Style No. 359—B. & S. Taper Sleeves with Morse Taper Holes

EXTENSION TYPE
Style No. 354—Morse Taper Extension
Sleeves with Morse Taper Holes





Tons of metal—guns and ammunition—fuel—charging over a blasted landscape at 45 miles per hour—the “pill box” has become a sprinter in the modern tank.

Performance of this effective war machine depends on the modern engine power plant—the way it is designed and made. This engine must have amazing stability, durability—highest all around performance qualities. Yet it must lend itself to fastest maintenance or repair with minimum equipment.

Microhoning contributes largely to this result because it offers the most modern method of final precision stock removal and close control of surface character.

It provides a high degree of accuracy and any desired surface finish—without injurious frictional heat—without deformation of sub-surface metal structure.

Without this close precision and controlled finish, modern tactical use of the tank would be impossible.

How to Make a Sprinter out of a **PILLBOX**

Some Microhoned Tank Bores

Gas and Diesel Engine Cylinder Bores and Sleeves • Connecting Rod Bores (Large End) • Valve Guide Bores • Diesel Fuel Injector Bores • Transmission Gear Bores • Gun Recoil Cylinders • Gun Predictor Hydraulic Cylinders • And Many Other Parts

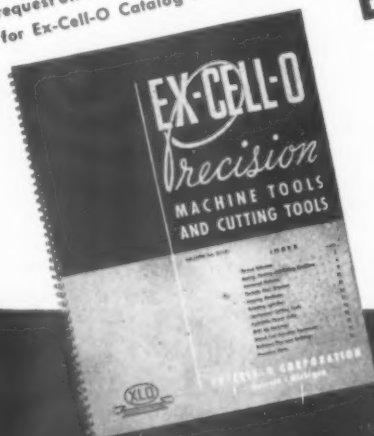


MICROMATIC HONE CORPORATION
DETROIT, MICHIGAN

MANY industries depend upon EX-CELL-O Precision Thread Grinders for production of accurately threaded hardened parts for war work. Outstanding is the aircraft industry. Aircraft engine manufacturers in the United States are using precision thread grinders for threading parts such as cylinder barrels, crankshafts, propeller shafts, crankshaft bearing bolts, connecting rod bolts, tappet adjusting screws, etc. . . . EX-CELL-O precision thread grinders are so dependable that what formerly would have been considered very delicate threading operations on aircraft engine parts are now handled easily, with assured accuracy, high finish, production. . . . EX-CELL-O precision thread grinders grind fine threads directly from heat-treated blanks and finish grind coarser threads after heat treatment.

EX-CELL-O CORPORATION • DETROIT

Below: Ex-Cell-O's new catalog on precision machine tools, cutting tools, and other Ex-Cell-O precision products. Contains illustrations, descriptions, and specifications. A copy will be mailed free to any request on business letterhead. Ask for Ex-Cell-O Catalog No. 27121.



"We finish grind these fine pitch threads from hardened solid blanks . . . on EX-CELL-O Thread Grinders!"

XLO

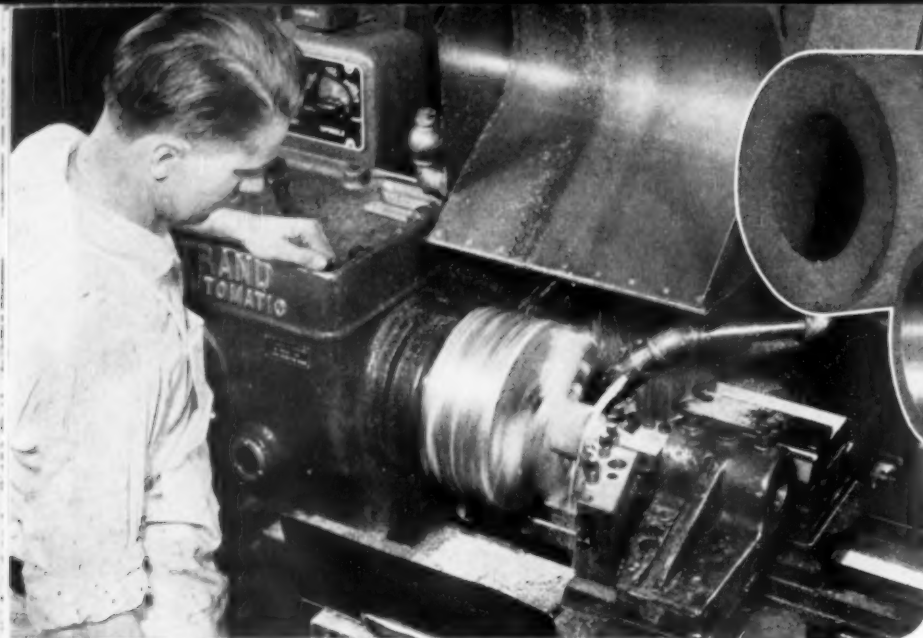
EX-CELL-O for PRECISION

Extreme Accuracy In Form and Lead...With High Production

At Right: One of nine styles of Ex-Cell-O Precision Thread Grinders—Style 33 Automatic.



Precision THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT • PURE-PAK CONTAINER MACHINES • R. R. PINS AND BUSHINGS • PRECISION PARTS



Above: First operation on the bushing, see tooling diagram below

Left: Rough
Bronze Bush-
ing

Left: First
operation on
bushing, see
below

Right: Sec-
ond opera-
tion on
bushing,
see below

It Used to Take 86 Hours to Turn 300 of These Bushings...

an Automatic Lathe saved 20 hours
**on the
Same Number of Parts**

These bronze arbor-support bushings were formerly turned on two modern machine tools. Without using any increase in cutting feeds and speeds, the turning time of 300 bushings was reduced from 86 hours to 66 hours by turning the work on a Sundstrand Automatic Lathe. Bushings in other sizes, retainers, gear blanks, and many other parts are run over this same machine with similar effectiveness. The speed and simplicity with which this machine can be set up and changed from one job to another makes it possible and profitable to include short-run turning work of this nature on this modern automatic lathe.

Check the operation performed on this job with similar parts in your plant. Lot sizes as low as 25 pieces have been turned faster on Sundstrand Automatic Lathes than on other turning equipment. Perhaps you have a collection of parts that can be processed on a Sundstrand Automatic Lathe...our engineers will be glad to study them and offer suggestions for obtaining increased production.



These Men Can Help You . . .

Let our engineers assist you in the selection of the proper automatic lathe for your job, and make tooling suggestions for faster turning of both short and long-run work. Send complete, accurate information with each inquiry.

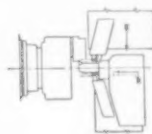
How to Turn Short-Run Work Faster . . .

is illustrated in this booklet. Twenty-two front and six rear carriage cycle diagrams are also illustrated. Write for your copy. Ask for Bulletin 819

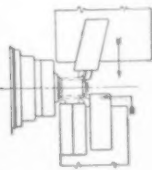
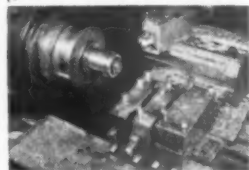


Bushings Turned in Two Operations

This is the tooling used to turn these bushings on a Sundstrand Model 10 Lathe.



1st Operation: Boring straight through, turning, grooving on O.D., facing and chamfering one end.



2nd Operation: Taper turning, turning, grooving, facing, chamfering opposite end.

Quicker Set-ups Permit Turning Short Runs . . .


Cycles are set up quickly and changed over easily by adjusting dogs on a graduated disc as indicated at right. No cycle control cams required.



SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

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Machine tools will also eliminate *this* kind of

FOXHOLE!

For this, too, is a scene of bitter combat. It's a foxhole-in-the-wall, in the battle for freedom from want... in the war we must win here at home.

Machine tools are the only weapons with which that war can be won. Machine tools at work! For there is scarcely a product or a man-made thing—from the simplest bed and chair to the most intricate mechanism—that is not the creation of machinery or tools that stem from a handful of *basic precision machine tools*.

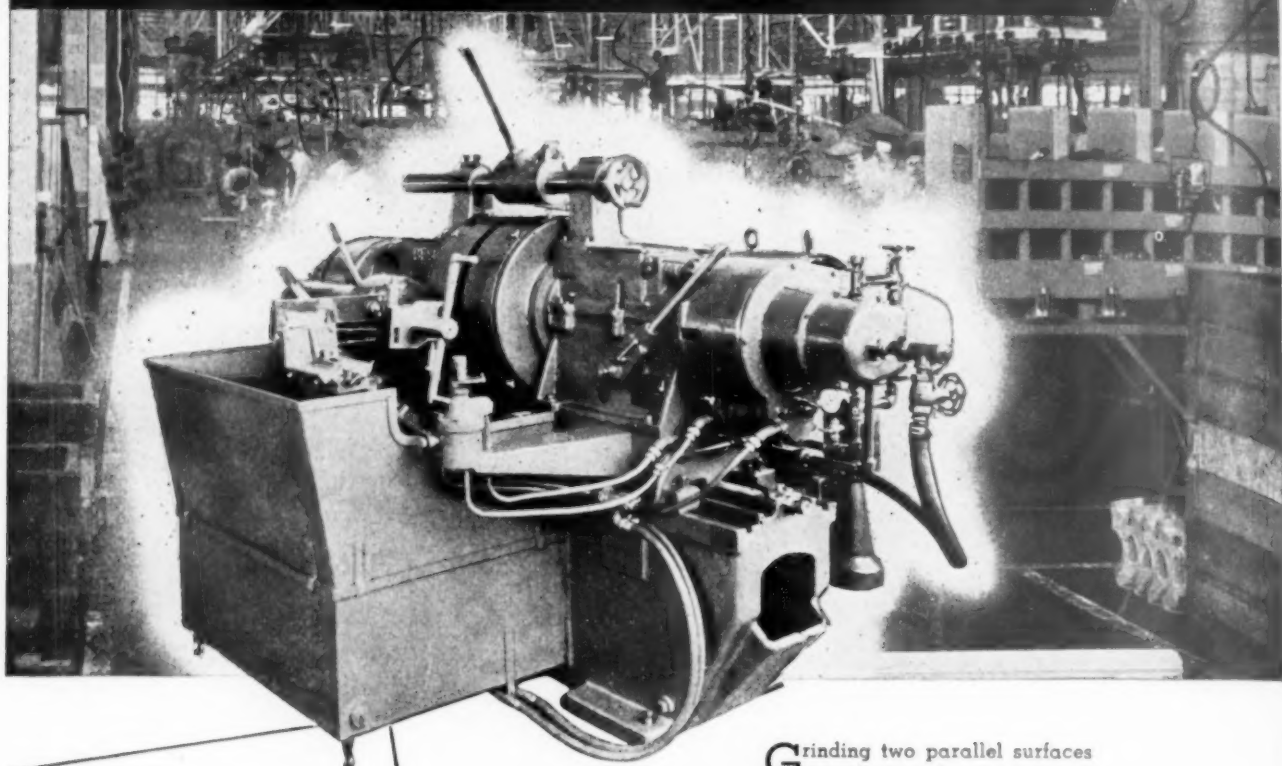
And one of these—the internal grinder—is essential to the creation of nearly every machine and tool that will make for a finer standard of living after this war.

It is because of this that the job ahead of us, here at Bryant, will continue to be a truly great one when the war is won. Call on us!



BRYANT CHUCKING GRINDER COMPANY Springfield, Vermont, U. S. A.

How the Well-Equipped Shop Handles PARALLEL SURFACE GRINDING JOBS



For Example...

The model 218-20 inch Besly Double Spindle Grinder shown delivers accurately ground work for long periods with infrequent maintenance. In this machine, the only parts to slide to and away from the work are the spindle, bearings and the special quill or sleeve in which they are mounted. The quill moves freely on a grease-tight slide. No grit, dirt or water can enter to cause wear—and consequent major overhauls. This basic design feature also permits locking the tie bar at the top in a fixed position, adding to machine rigidity and promoting accuracy of work.

Grinding two parallel surfaces simultaneously is a common enough operation. But as handled in the well-equipped shop on a Besly Double Spindle Grinder the results are anything but common. The difference, in terms of better production, greater accuracy and lower operating expense, is Besly engineering experience.

Besly's experience, extending over half a century, explains the company's success in matching the right machine design and the right abrasive to each of many different grinding operations and metals, including the hardest of the modern alloys. This experience, plus Besly's outstanding record of continuing service to customers long after the initial sale, are sound reasons for consulting Besly engineers on any current and postwar grinding problems.

Multiply Output of Present Grinders with Besly Titan Steelbac Discs

Down-time is reduced to a matter of minutes with these easy-to-mount, bolted-on Besly Titan Steelbac grinding members. What's more, they can be used right down to the backing. And they are consistently uniform—discs of a specified grade are exactly alike from one delivery to another.

For full information on Besly Titan Steelbacs, send for this Booklet.



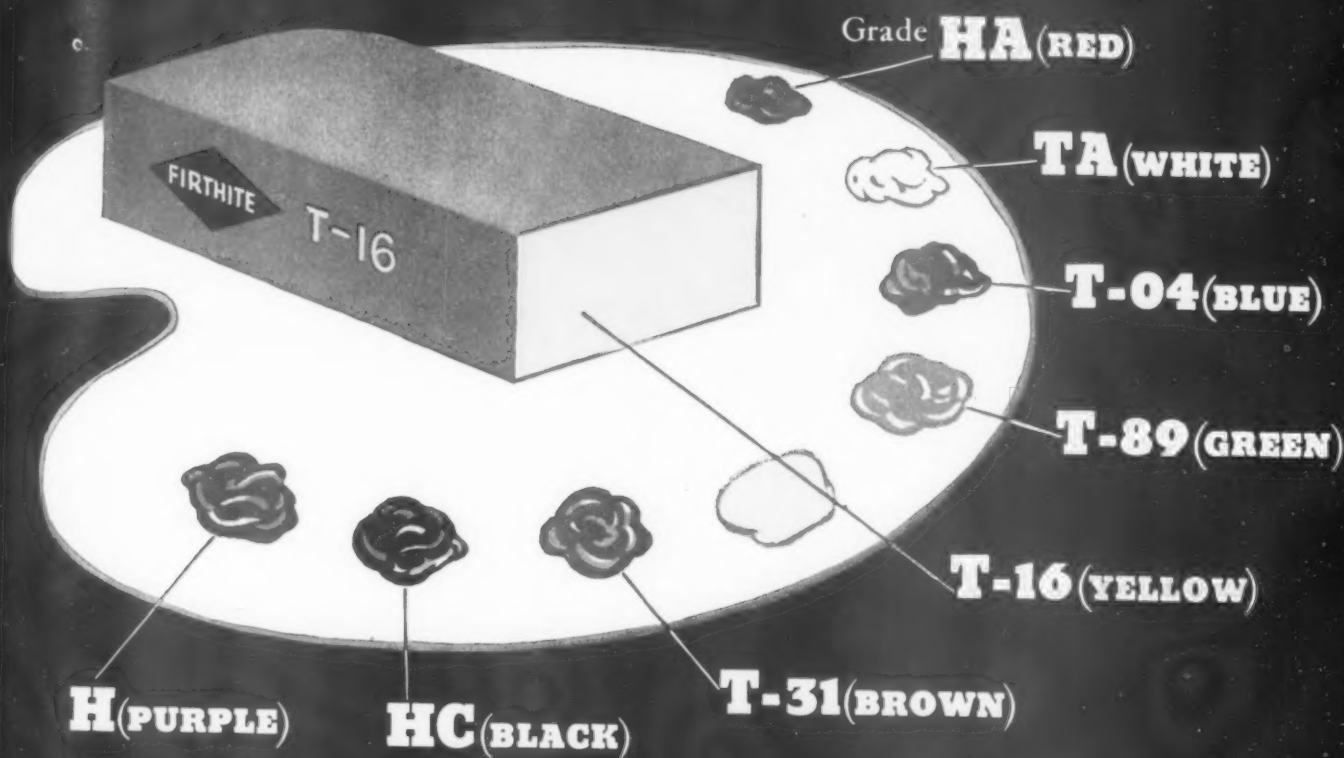
BESLY

**BESLY GRINDERS AND ACCESSORIES
BESLY TITAN ABRASIVE WHEELS • BESLY TAPS**

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THE TOOL ENGINEER

Firthite
"Color-Branding"
GETS A BIG HAND
FROM COAST TO COAST



COLORS, on Firthite Sintered-Carbide Tips, are proving a most popular means of telling one grade from another. The color scheme recently introduced by Firth-Sterling, as another service to Firthite users, sets a convenient standard for the industry. A Firthite Engineer will gladly explain how this color system can be used to advantage in your shop.

Send for
COLOR CHART

Handy guide
to selection
of Firthite



Firth-Sterling Steel Company

OFFICES: McKeesport, Pa. NEW YORK-HARTFORD-PHILADELPHIA-CLEVELAND-DAYTON-DETROIT-CHICAGO-LOS ANGELES

"JUST LIKE WE USED BACK HOME!"

Yes, those Monarch lathes which many of our fighting men found so dependable back home, are now equally hard at work, all over the world. In supply and repair depots and bases, they are busy day and night, helping to keep our fighting equipment in good order.

Even such rough handling as pictured here cannot stop the precision performance of these ruggedly built, rigid tools. They stand

up and take it, whether on advanced bases abroad or in war plants at home.

These Monarch lathes have a long record for fast, accurate production of the widest variety of work. To produce more pieces, at less cost and effort, make Monarch your lathe choice.

THE MONARCH MACHINE TOOL COMPANY
SIDNEY, OHIO

MONARCH LATHES
Save Time



Now
AVAILABLE **FROM STOCK**



VINCO *Angle Tangent to Radius* **DRESSER**

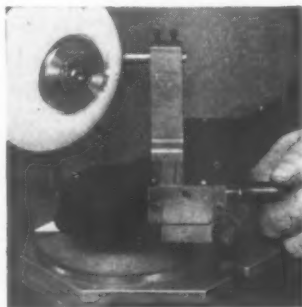
MODEL B-1

Since the VINCO B-1 DRESSER (angle tangent to radius) was designed and its manufacture started, the boss of the Dresser Department, Jimmy Allen, has made it his personal business to see that each and every Dresser was built with VINCO precision throughout.

The demand for this sturdy little Dresser has been increasing—and VINCO has increased manufacturing facilities accordingly. Production has gradually gained until now an adequate stock of Dressers

is on hand. This will mean much to those wishing immediate delivery.

But in spite of the increased production, the quality of the Dresser still remains VINCO quality—precision built into every part.



The VINCO B-1 Dresser has almost universal applications; and with the care generally given precision tools, its service, under ordinary production conditions should be long and economical.

Write for the B-1 Folder which contains full details.

VINCO CORPORATION, 8855 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN

MILLIONTHS OF AN INCH FOR SALE BY VINCO

VASCOLOY-RAMET
CARBIDE
TOOLS & BLANKS

VALUE

Is Measured By Results

IN 1930, we developed and introduced the first successful cemented carbides for machining steel. Before that time, no one had been able to make a good steel cutting grade of carbide.

This contribution was revolutionary. It received instant recognition. Vascoloy-Ramet's outstanding contribution to the science of machining steel blazed the trail that many others have sought to follow.

Today, as in 1930, the same painstaking development and research continues. Vascoloy-Ramet and the Fansteel Metallurgical Corporation (world's foremost producers of Tantalum) work hand in hand to assure tool users of peacetime quality under wartime conditions.

Vascoloy-Ramet's highest standard of quality in cemented carbides will be maintained because value is measured by results rather than price.


VASCOLOY RAMET CORPORATION

MAKERS OF VASCOLOY-RAMET CARBIDE TOOLS & TANTUNG CAST ALLOY CUTTING TOOLS

Tantung "Fills the Gap" Between High Speed Steel and Cemented Carbides. Send for the New Tantung Catalog

**NORTH CHICAGO, ILLINOIS • • • DISTRICT
SALES & SERVICE IN PRINCIPAL CITIES**

6 3/4 TON

CYLINDER MACHINED

in Two Settings

With **75%** Savings In Time

This prominent manufacturer of large hydraulic presses uses his G. & L. Horizontal Boring, Drilling and Milling Machine for machining all cylinders. Ninety-five per cent of his work requires indexing. Conse-

quently, a rotary indexing table is used in conjunction with the machine. This eliminates resetting and indicating time and saves 75% of the total time on most jobs.

Operations Include Boring, Drilling, Milling and Tapping

The wide speed and feed range available on the G. & L. Horizontal makes it possible to include the machining of all surfaces and holes, including the drilling and tapping operations. This eliminates the necessity of removing and transferring large, heavy parts from machine to machine.

87 1/2" Continuous Bore 22 1/2" Dia. Optional

Of interest is the method used in boring the long cylinder. The bore is not relieved, but one continuous surface of cast steel. After the bar has been fed to its full length of travel, the boring head is unclamped, the bar run back and the head reclamped. The boring is then continued from the point at which it was previously stopped...without leaving an objectionable mark.

Details of Job

FIRST SET-UP—Casting set on rotary table as shown above. Center bore is picked up and vernier readings of headstock and table registered.

OPERATIONS—Cylinder is rough bored to determine any defects. It is then semi, and finish bored. A final burnishing operation completes the boring. Subsequent operations consist of milling, drilling and tapping ...see drawing.

Index 90° and finish pad near

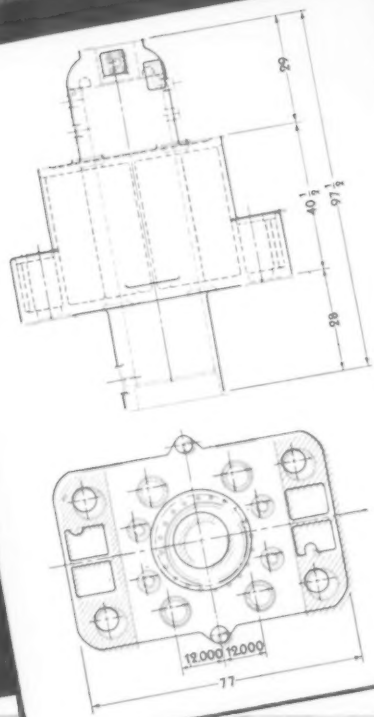
open end of cylinder.

Index another 90° and mill all pads and surfaces...all holes drilled and tapped.

SECOND SET-UP—Set plug in middle of rotary table and place cylinder over plug with small end down.

OPERATIONS—All pads at small end of cylinder are milled, drilled and tapped by indexing similar to the method used in first set-up.

Above: Final set-up in machining cylinder.



Right: Cyl-
inder for
825 Ton
Hydraulic
Press.

Additional Data

...covering the complete line of Giddings and Lewis machines and time-saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin No. TE 123



GIDDINGS & LEWIS MACHINE TOOL CO.

132 DOTY STREET, FOND DU LAC, WISCONSIN



ARE YOU

GETTING COMPARABLE
SPEEDS ON LARGE SCALE
MAINTENANCE THREADING?

IF NOT GET AN OSTER "WILCO"

OSTER "WILCO" PIPE THREADING SPEEDS!

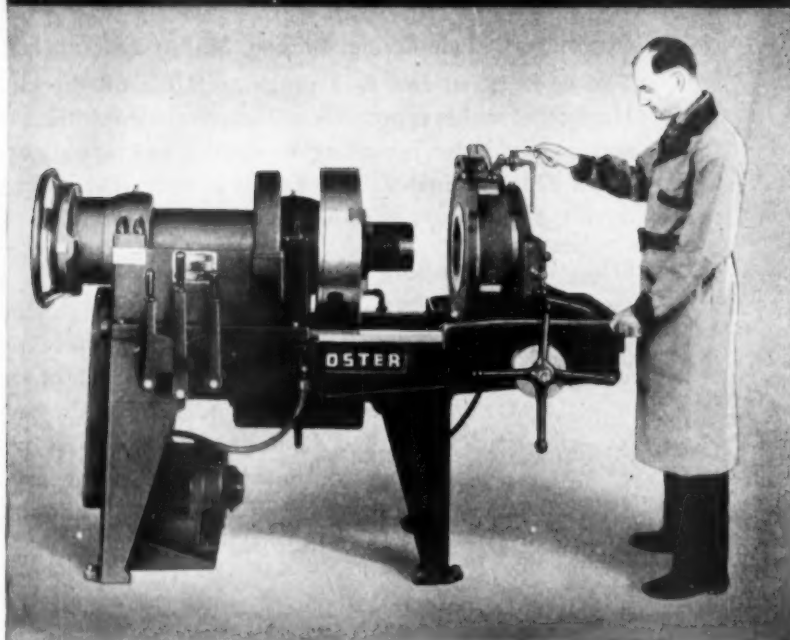
No. 704 "WILCO"

Pipe Size	Threading Time
1"	16 seconds
1 1/4"	16 seconds
1 1/2"	24 seconds
2"	25 seconds
2 1/2"	38 seconds
3"	40 seconds
3 1/2"	56 seconds
4"	58 seconds

No. 706 "WILCO"

Pipe Size	Threading Time
1 1/2"	19 seconds
2"	20 seconds
2 1/2"	30 seconds
3"	31 seconds
3 1/2"	48 seconds
4"	49 seconds
5"	70 seconds
6"	74 seconds

Note: Above time studies based on cutting full American National Standard pipe threads at recommended speeds.



Speed with accuracy equals low cost with safety! That's what the Oster "WILCO" Threading Machine is designed to do for YOU on YOUR maintenance threading of pipe and bolts.

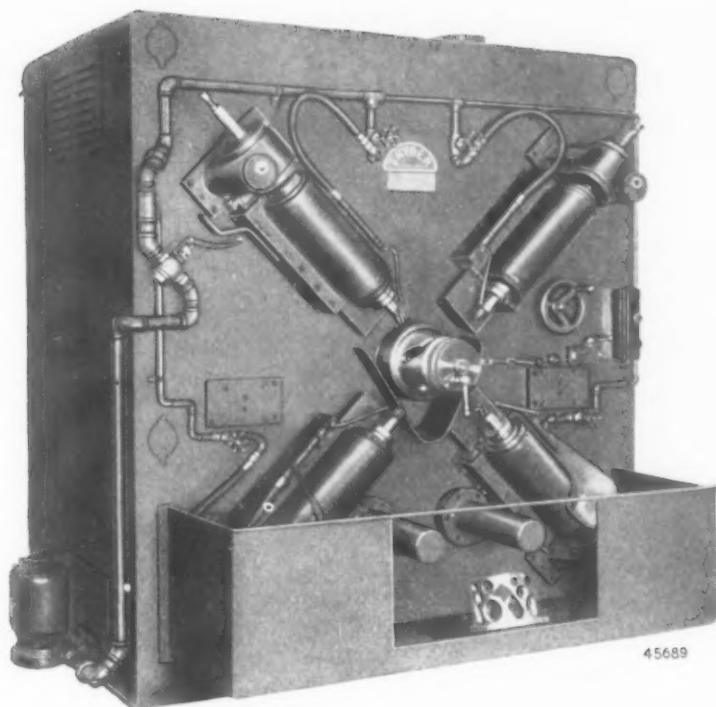
The "WILCO" Die-Head handles ALL sizes within range of each machine and one set of chasers threads all sizes of the same pitch without change. Movement of cam lever sets chasers to any size.

Chasers are *high speed steel* . . . small, economical, segmental type . . . held in massive steel holders for rigidity. One or more chasers replaceable without renewing entire set.

Other important features are illustrated and explained in CATALOG 10-A. Write for a copy.

OSTER for faster, better threading

THE OSTER MANUFACTURING COMPANY, 2063 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.



Snyder Machine Speeds Milling of Slots on Cams of Urgently Needed Propellers

With a production of seven cams an hour at 80% efficiency, this Snyder "special" has increased importantly the output of urgently needed aircraft propellers.

Developed for finish (or rough) milling four cam slots in each cam, the machine is equipped with four spindles to mill all four slots at one time. Spindles are mechanically inter-connected (each has its own hydraulic cylinder) and go through rapid approach and feed into the work in small steps while the work piece reciprocates and rotates in conformity to the master cam. For smooth cam-follower operation, the master cam is designed with a rise-to-length ratio of one in five. Cam movement is integrated with the motion of the fixture.

Infeed on tools, per reciprocation of part, is adjustable over a wide range of from .010" to .150". The spline mill principle of feeding the tools into the work step by step results in excellent finish and good tool life.

Tool spindles are driven from electric motors through v-belts and worm wheel drive and are mounted on precision tapered roller bearings, allowing take-up for possible wear.

Fixture spindle and slide are hydraulically actuated and provide two feed rates—one for the cut through the shallow angle of the cam slot and a slower rate for the steeper portion of the slot. All hydraulic controls are adjustable and are located inside the machine to prevent tampering once they are set. Fixture spindle is mounted on pre-loaded tapered roller bearings, insuring rigid mounting and vibrationless operation of the

machine. Provision is made for take-up on the pre-load.

A similar machine developed for rough milling the slots would eliminate the step by step infeed of the cutters and cut the slots in one pass, leaving from $\frac{1}{16}$ " to $\frac{1}{8}$ " of stock in the slots for finishing.

ABOUT YOUR POST-WAR PLANS...

For 20 years Snyder has been cooperating with leading industries in devising special-purpose machines and methods for fast, economical, high-quality production. This experience is at your service NOW to help you prepare for profitable post-war production and re-employment, both so essential to post-war prosperity. Write in full confidence.

SNYDER TOOL & ENGINEERING COMPANY
3400 East Lafayette — Detroit 7, Michigan

SNYDER
DESIGNERS AND
BUILDERS OF MACHINERY
FOR HIGH PRODUCTION
AT LOW UNIT COST

TAP PERFORMANCE 1944 STYLE

In tapping soft steel forging, cold rolled steel and screw stock use plenty of lubrication. Particularly essential if stock has been cold swaged, drawn, or extruded. In tapping blind holes, fill the hole with oil before tapping.

Don't lap taps with lapping compound — such lapping dulls the cutting edges and rounds the thread crests of the taps. The same applies to etching a tap down with acid. It is a poor practice at best.

A dull tap cuts rough, oversized threads; chips out teeth; has a tendency to pick up stock being cut; and is more likely to break.

For extreme accuracy; use Precision Ground Thread Taps. For reasonable accuracy; use Commercial Ground Thread Taps. For production tapping, Cut Thread Taps will be found as accurate as the screws to be used.

Taps are less likely to break at high speeds than when running slowly. But be sure tap and hole are in true alignment. The name WINTER on taps means much more than the identity of the maker. It is a guarantee of accurate, economical and productive thread cutting.

Do not force the taps when entering the hole or drawing it. Forcing will vary the pitch or lead from that of the tap and also produce bell-mouthed holes.

Use plenty of Lubrication. Particularly in blind holes.


"Keep it sharp"
A dull tap
over size
more likely
Don't use tap

"Keep it sharp"
Cuts rough
and is
less ch

The size drill used with a tap is very important. If drill is too small the tap must ream out the hole as well as cut a thread. Twice as much power is required to tap a FULL thread as 75% of a full thread. A full thread is rarely required, and the strength of a 75% full thread is well within safe limits. Tap life is also greatly prolonged.

A DIVISION OF NATIONAL TWIST DRILL AND TOOL CO.

Winter Brothers

COMPANY  Wrentham, Massachusetts, U.S.A.
BRANCH STORES: SAN FRANCISCO, CALIFORNIA - CHICAGO, ILLINOIS - DETROIT, MICHIGAN



WE ★
NOMINATE
 ★ **FOR GLORY** ★★

Gentlemen, he's tired. This patient and venerable creature is the most overworked piece of machinery in the world. For countless centuries the old one-horsepower hay burner was the most efficient engine we had, and he has done much of this world's work.

Today, aeronautical engineers have packed a horsepower into a few ounces of metal, and more than 2,000 horsepower into a single engine. Tolerances are measured in thousandths of an inch, and bearing smoothness is measured in millionths.

There's a reason for such precision as this. Into the cylinders of that finished engine will pour a torrent of 15-ton explosions at the rate of hundreds of blasts every second during the million miles of flight that is the life expectancy of the engine.

And that, brother, is horsepower!

Today, Jones & Lamson machine tools, engineers and service men will be found on every airplane engine production line in America, helping to make possible this miracle of power . . . They are at your service. Call upon them now.

Universal Turret Lathes . Fay Automatic Lathes . Automatic Thread Grinders . Optical Comparators . Automatic Opening Threading Dies



JONES & LAMSON

MACHINE CO., SPRINGFIELD, VERMONT, U.S.A.
Profit-producing Machine Tools

**BELIEVE IT
OR NOT, GENTLEMEN
WE CAN MAKE ALL DELIVERIES
ON TIME!**

IT CERTAINLY PAYS
TO INSTALL

**TURNER
UNI-DRIVE**
Motorizes Machine Tools



These Features are Responsible:



- No belts to shift—Drives to large step of cone at all speeds
- Eliminates overhead line and counter shafts
- All advantages of geared head with belt drive smoothness

The high-speed, volume-production methods of wartime call for modern machines, modern methods. More speed ... greater production ... you must have them to keep apace! Enlist the aid of TURNER UNI-DRIVES. They'll increase production like an extra shift ... save time ... speed up work ... keep down power costs. They're doing it in scores of shops and plants. They'll do it in yours. TURNER UNI-DRIVE is the *successful* one motor drive.

Easily and quickly installed. They do away with overhead counter shafts ... no belts to shift. Increase the efficiency of machine and operator. One trial will thoroughly convince you.

Right now ... today ... investigate TURNER UNI-DRIVE. See your dealer, or write or wire us for full information.

IT DOES THE JOB on Lathes, Shapers, Milling Machines, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines and various machine tools. Also for Browne & Sharpe and Cleveland Automatic Screw Machines.

THE TURNER UNI-DRIVE COMPANY

(Sales Division: Turner Machinery Co.)

3416 Terrace Street, Kansas City, Mo.

NOW AT WORK FOR VICTORY ★ ★ ★

PRODUCING MACHINE TOOL DRIVES • ORDNANCE TOOLS • AIRCRAFT FITTINGS

A Cost Cutting Tool FOR MANAGEMENT

CLEVELAND'S Single Spindle Automatic has established a reputation, not only as an outstanding machine tool in individual performance, but as a particularly fine "tool for management". By management we mean clear across the board from production men to presidents—anyone whose headache it is to produce, to profit, and to maintain employment.

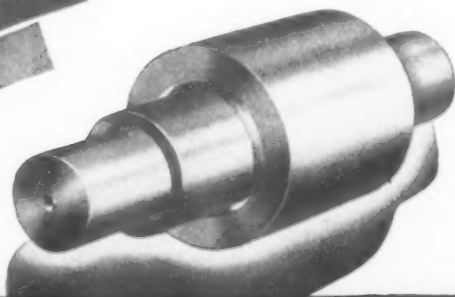
This is true because the very essence of Cleveland design is unending search for the last word in elimination of waste motion and material in production. With every Cleveland has gone (in addition to modern development of the tool itself) full benefit of the advice and counsel of engineers whose years of specialization have made them authorities on methods.

This advice and counsel now are made available to *all* management, whether owners of Clevelands or not, in a new service. We call it a "Production Cost Patrol" because its purpose is to help your production men "police" methods for all possible improvement. The steps are simple . . .

1. Upon request you will be given a statement in detail of the engineer's method of surveying your plant, and his credentials will be submitted.
2. The engineer will spend as much time as necessary in your plant, making detailed studies of operation without interrupting production or making demands upon the time of your organization.
3. A detailed written report will be made for you, with proposals for changes in method wherever opportunities for savings are found.

Proposals for improved method are by no means limited to cases where the savings can be made on Clevelands. In many studies made by Cleveland engineers new methods involving substantial savings have been found for the equipment already in use. In any event there is no charge.

If you have a rush problem, a collect wire will bring prompt consultation.



A new product information
bulletin on Cleveland's
complete line is ready.
Send for your copy.



THE CLEVELAND AUTOMATIC MACHINE COMPANY
CLEVELAND, OHIO



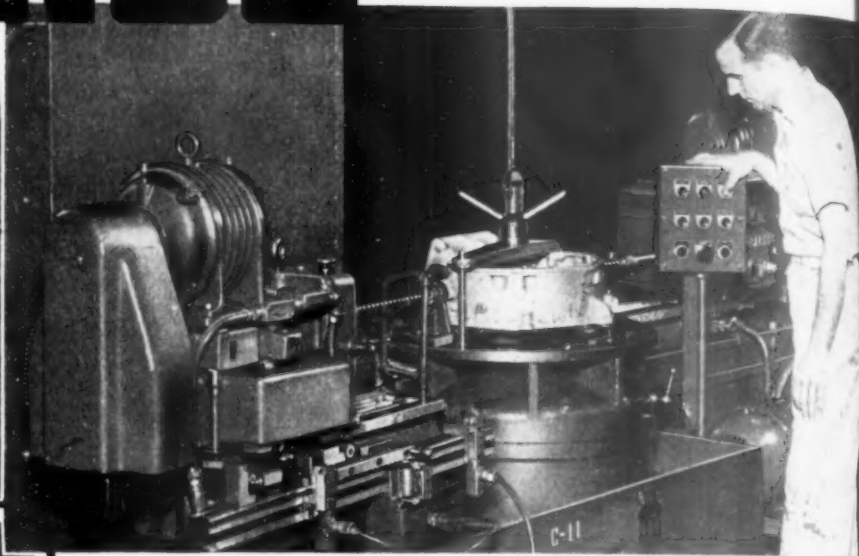
SALES OFFICES

CHICAGO: 1408 Civic Opera Building
DETROIT: 540 New Center Building

NEWARK: 902 American Insurance Building
CINCINNATI: 1315 American Building

SAVINGS *in time... in manpower*

with 
**UNIT-TYPE
MACHINES**

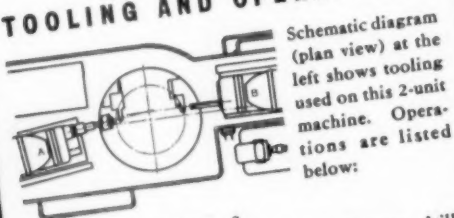


*Conveniently Located Push-Button Control Governs Entire Machining Cycle
Tooling and Operations Described Below.*



Intermediate Rear Crankcase for Airplane Engine

TOOLING AND OPERATIONS:



Schematic diagram (plan view) at the left shows tooling used on this 2-unit machine. Operations are listed below:

Number of spindles: — 2.

Unit A — 1 spindle — 21-64" diameter drill.
Unit B — 1 spindle — 21-64" diameter drill.

Type of Cutting Material: H.S.S.

Accuracies:

Diameters $\pm .004$ — $\pm .003$ "
Locations $\pm .010$ ".
Angular Locations $\pm 1^\circ 0'$.

No. of Machines Replaced: 1.

Previous Production Time:.....7.95 minutes
Present Production Time:.....6.45 minutes
Savings:.....1.5 minutes

**W.F. & JOHN
BARNES**

1.5 MINUTES MACHINING TIME SAVED ON DRILLING AIRPLANE ENGINE CRANKCASE; ONE OPERATOR NOW HANDLES 2 MACHINES

In drilling, spot facing and countersinking operations in an airplane engine rear crankcase, this manufacturer saved time and increased the efficiency of his operator with a W. F. and John Barnes unit-type 2-spindle two-unit machine. This machine cut machining time from 7.95 minutes to 6.45 minutes, a saving of 1.5 minutes, replaced one machine completely and enabled one operator to operate two machines.

YOU CAN EFFECT SIMILAR SAVINGS

Whether you are faced with high production requirements or whether you machine various parts in moderate size lots, a W. F. and John Barnes Unit-Type Machine will mean savings in time and manpower. These machines are built from standard hydraulic feed and drive units. These standard units can be mounted in any position and easily re-arranged to accommodate any change in the design of your part. To meet the requirements of a number of different parts, many of these unit type machines have been furnished with quick-change tool heads. When you retool for peace-time production, this versatility will mean even greater savings.

CONSULT OUR ENGINEERS — NO OBLIGATION

Our engineering staff will give you a complete analysis of your production problems. Their recommendations, backed by years of experience in designing and building special machine tools for high production, will mean increased savings in time and manpower for you. Call on them without obligation.

FREE — THE STORY OF SAVINGS BY 8 OTHER MANUFACTURERS



Write for these 8 bulletins today. Each traces a machining problem from the preliminary survey to the final machine design. They may suggest more productive tooling setups for today... valuable information for use when you retool for peacetime production.

W. F. and JOHN BARNES

325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

STEP UP *Speed*
CUT DOWN *FATIGUE*
WITH **ARO**
PNEUMATIC TOOLS



*New Model 101 ARO Pneumatic Drill with all-plastic housing and handle
... 1 lb. 12 oz. weight ... 2500 r.p.m. ... $\frac{1}{16}$, $\frac{1}{8}$ or $\frac{1}{4}$ " Jacobs chuck.*

● When ARO Pneumatic Tools enter your production picture...you'll find that speed and efficiency go UP, while fatigue goes down!

Because of their light weight, handy size and tremendous power...ARO Tools are demanded increasingly today for a wide range of small tool applications. This includes operations such as drilling, grinding, screw-

driving, filing, nut-setting and many special applications.

ARO helps you keep these tools in round-the-clock operation by offering immediate delivery of repair parts and excellent field service at all times. Investigate ARO Pneumatic Tools *now* for your requirements. Write for catalog. The Aro Equipment Corporation, Bryan, Ohio.



Precision Grind CUTTERS AND END MILLS



Girl operator precision grinding $\frac{1}{2}$ " dia. 2-Flute High-Speed Steel End Mills, sharpened to a 15° cutting angle. Total time required to grind cutter from hardened and ground blank is 5 minutes per cutter.

Saves Time and Money... with a **GORTON** CUTTER GRINDER

This manufacturer has four Gorton 375-2 Cutter Grinders for sharpening cutters and mills used on a number of precision machines, including three Gorton Pantograph Engravers and a Duplicator.

Girls operate all four grinders. It requires only about two months to develop a girl's skill sufficiently to perform the most critical grinding operations on most types of precision cutters and end mills.

ACCURATELY GROUND TOOLS are indispensable to Super-Speed precision milling. The Gorton 375-2 Cutter Grinder grinds cutters with 2, 3 or 4 flutes, or flats...any diameter, taper, radius or clearance within the capacity of the machine. With diamond impregnated wheels (interchangeable with standard wheels), tungsten carbide cutters can also be ground.

Install a Gorton 375-2 Cutter Grinder for increased accuracy and production with smoother finish in *your* milling operations.

No. 375-2 Grinder, equipped with No. 717-1 Universal Tool Head and No. 9761 Pedestal, complete, ready to operate

\$612



GEORGE GORTON MACHINE CO.

1322 RACINE STREET, RACINE, WISCONSIN, U.S.A.

FOR OVER 50 YEARS Specialists in "Tracer-Controlled" Machines

TYPICAL EXAMPLE OF CUTTERS
GROUND ON THIS GORTON GRINDER



Shown are a few examples of the wide range of cutter grinding accomplished on the Gorton 375-2

COMPLETE SET OF CUTTERS AND
END MILLS WITH FREE HANDY
CUTTER RACK FURNISHED



This convenient rack is furnished free with assortment of Gorton Cutters and End Mills. Saves time and money in mold and die work.

FREE

For complete details and additional accessories write for Gorton Accessories Catalog offering 580 aids to production.





With the proper Gulf Cutting Oil

Plant steps up production 100%

in drilling and reaming

tracer cavity in 57mm. shot

Tool life greatly increased — finish substantially improved - - -

Another war plant steps up production through improved machine tool performance—thanks to the proper Gulf Cutting Oil, as recommended by a Gulf Service Engineer.

THE PROBLEM: Drilling and reaming the tracer cavity in 57 mm. armor-piercing shot, using soluble oil. Getting over 50% rejections, tool life 200 pieces. Rejections extremely costly, since these were final machining operations.

THE SOLUTION: Proper Gulf Cutting Oil put in service. No other changes in machining practice.

RESULT: Rejections entirely eliminated, representing a 100% increase in production, tool life increased 1,000%, finish substantially improved.

It will pay you to investigate Gulf Cutting Oils—call in a Gulf Service Engineer now and ask him how they can help *you* improve finish and increase production and tool life. For your copy of the booklet on Gulf Cutting Oils—which includes a helpful 45-page machining guide—send the coupon below.

GULF OIL CORPORATION • GULF REFINING COMPANY

**Tools are weapons
Treat 'em right!**



Gulf Oil Corporation—Gulf Refining Company TE
3800 Gulf Building, Pittsburgh, Pa.

Please send me, without obligation, a copy of the new revised booklet, "Gulf Cutting Oils," which includes a helpful Machining Guide.

Name,

Company,

Title,


Address,

NOW READY

SENECA FALLS AUTOMATIC

WORK

Drives Anything Between Centers



BULLETIN NO. D-43

DRIVER

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

● This new, comprehensive catalog of the Seneca Falls line of Automatic Work Drivers illustrates and provides complete engineering data on 18 standardized models now available to help speed war production.

If your manufacturing operations involve turning work between centers write for your copy of Bulletin No. D-43. These proven time and labor-

savers no longer need be made to individual customer's specifications; you can now order a standard unit from our new catalog just as you would a lathe chuck.

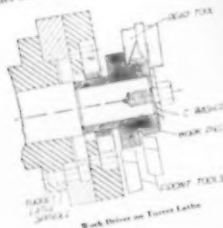
SENECA FALLS MACHINE COMPANY
SENECA FALLS, N. Y.

SENECA FALLS AUTOMATIC WORK DRIVER

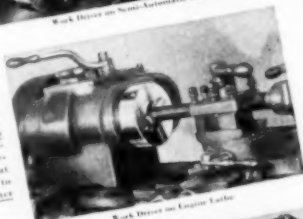
The Seneca Falls Automatic Work Driver is a self-centering, quick-acting, positive Work Driver designed to eliminate digging time, thus permitting an operator to operate two or more machines. It may be used on any type of Engine Lathe. Multiple Tool Lathes, and on Planer or Universal Grinders—in fact, on any machine carrying work on centers and requiring a means of rotation. It cannot, however, be used to drive hardened steel shafts since the jaw serrations will not grip on such work.

In addition to time-saving, the Seneca Falls Automatic Work Driver provides greater safety for the operator since there are no projecting screws or sharp corners to catch clothing or injure hands. Its positive gripping action is especially important when cutting—especially important when cutting the jaws tighten automatically in relation to the depth of cut—the handle the pull, the tighter the grip.

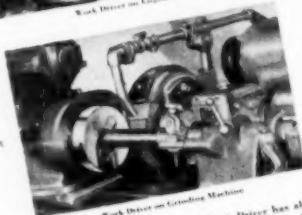
Elimination of tool chatter and strain on head center through a balanced and guided slide which is free to adjust itself to roundness of the work, thus balancing side diameter of the work, thus balancing the gripping pressure of the jaws, is a distinct advantage of the Driver.



Work Driver on Semi-Automatic Lathe



Work Driver on Engine Lathe



Work Driver on Grinding Machine

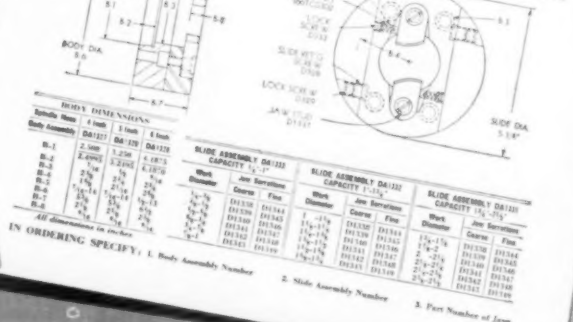
The Seneca Falls Automatic Work Driver has also been used to good advantage on Turret Lathes for driving work mounted on a stub arbor as shown in the line drawing at left. This method eliminates the necessity of pressing the piece on the stub arbor. It is simply pushed on the arbor by hand—the jaws of the Driver ensuring positive rotation of the piece.

TYPICAL
PAGES
FROM
BULLETIN

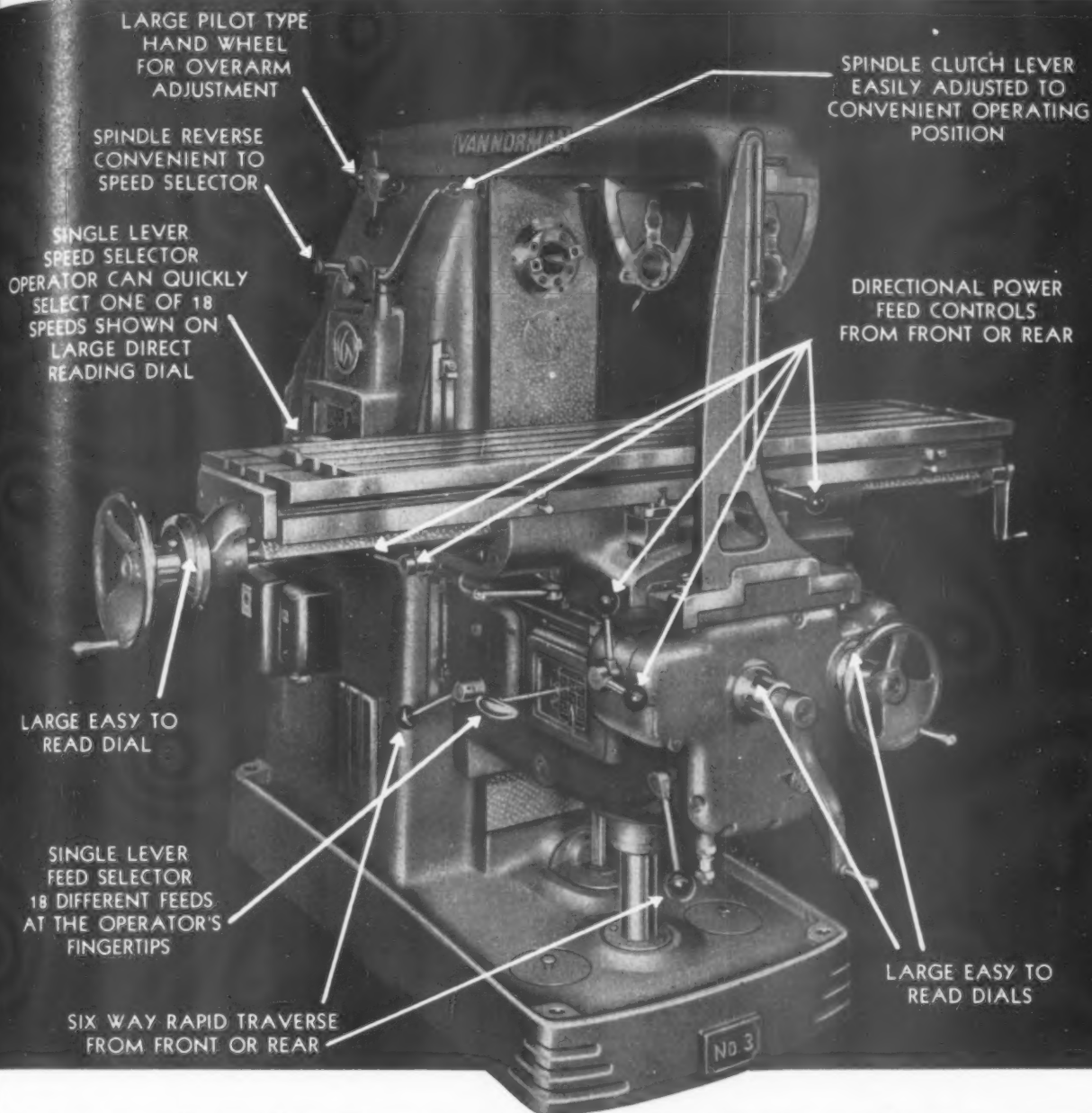
Direct Mounting Type: 4 1/16" dia. Light Duty Driver



Direct Mounting Type: 5 3/4" dia. Light Duty Driver



LATHE NEWS from SENECA FALLS



Conveniently Grouped, Easy to Reach Controls Speed Output on Van Norman Millers

All operating controls on Van Norman milling machines, such as front and rear directional power feed controls and six-way rapid traverse . . . single lever speed and feed selectors . . . spindle reverse selector . . . spindle clutch lever . . . are readily accessible and easily reached at all times by the operator. The result—increased work accuracy, greater output, and reduced worker fatigue.

Van Norman Millers are available in many models

and sizes—Ram type Universal millers for all purpose milling operations . . . Horizontal millers . . . Vertical millers . . . Production millers . . . Contour millers . . . Hand mills—each designed to provide fast, accurate milling with the utmost ease of operation.


Van Norman Company

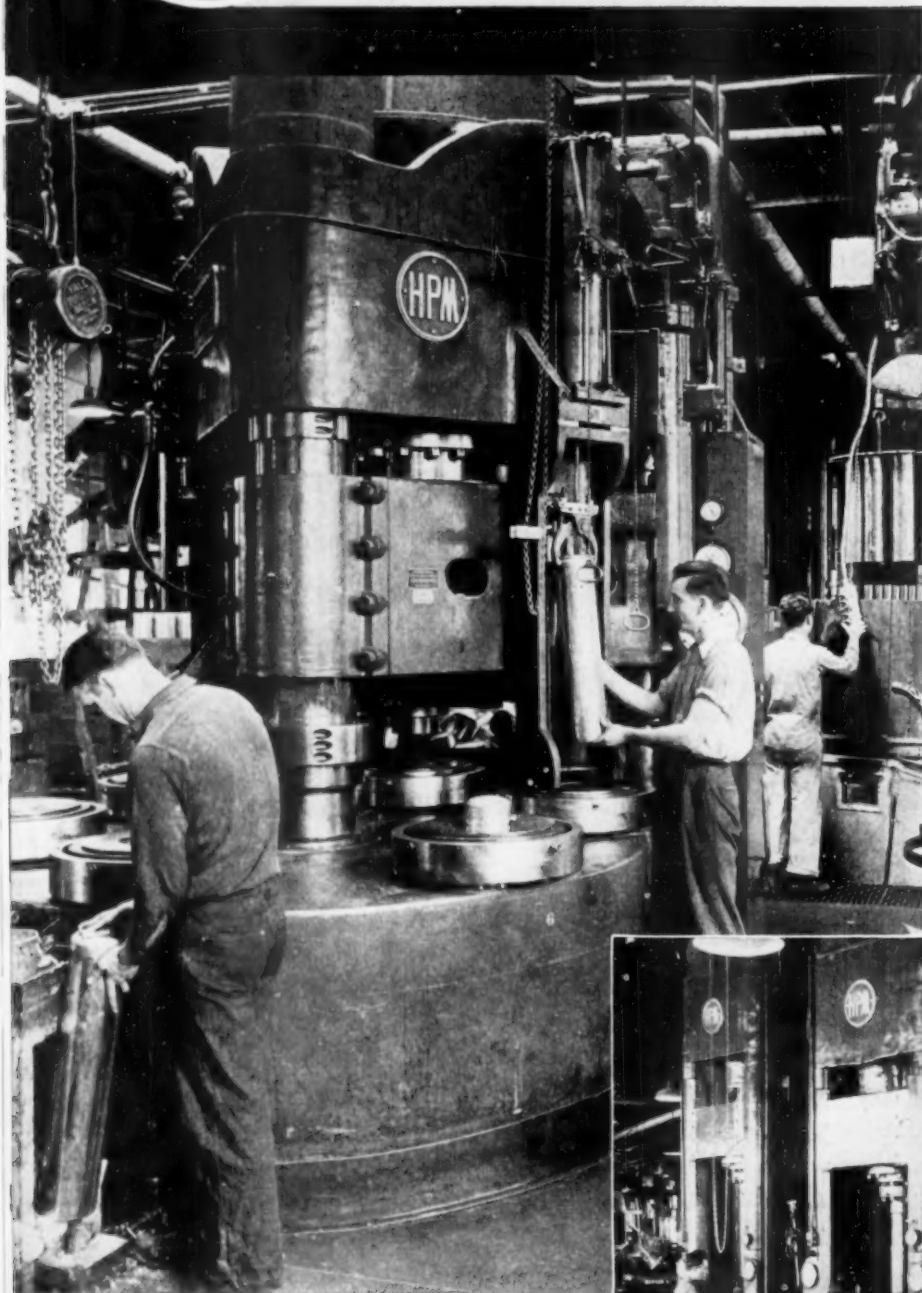
SPRINGFIELD 7, MASSACHUSETTS

IT PAYS TO VAN NORMANIZE

Final Victory assured by



"All-Hydraulic" FASTRAVERSE CARTRIDGE CASE PRESSES!



Above—A 2000-ton H-P-M cartridge case heading press equipped with a six station turret, permitting continuous production. Press will accommodate two heading tools which can be automatically operated in sequence.

Right—H-P-M FASTRAVERSE cartridge case presses drawing large artillery shell cases.

All presses illustrated are installed in the plant of one of America's largest producers of artillery shell cases

H-P-M FASTRAVERSE presses are establishing new records in the production of artillery shell cases. There are H-P-M presses for cupping, drawing, redrawing, heading and tapering operations, regardless of the size of the shell case. Each press is designed for high speed operation, and employs the H-P-M closed circuit operating system, permitting valveless and shockless reversal. H-P-M presses are completely self-contained, each being equipped with an H-P-M HYDRO-POWER radial hydraulic pump.

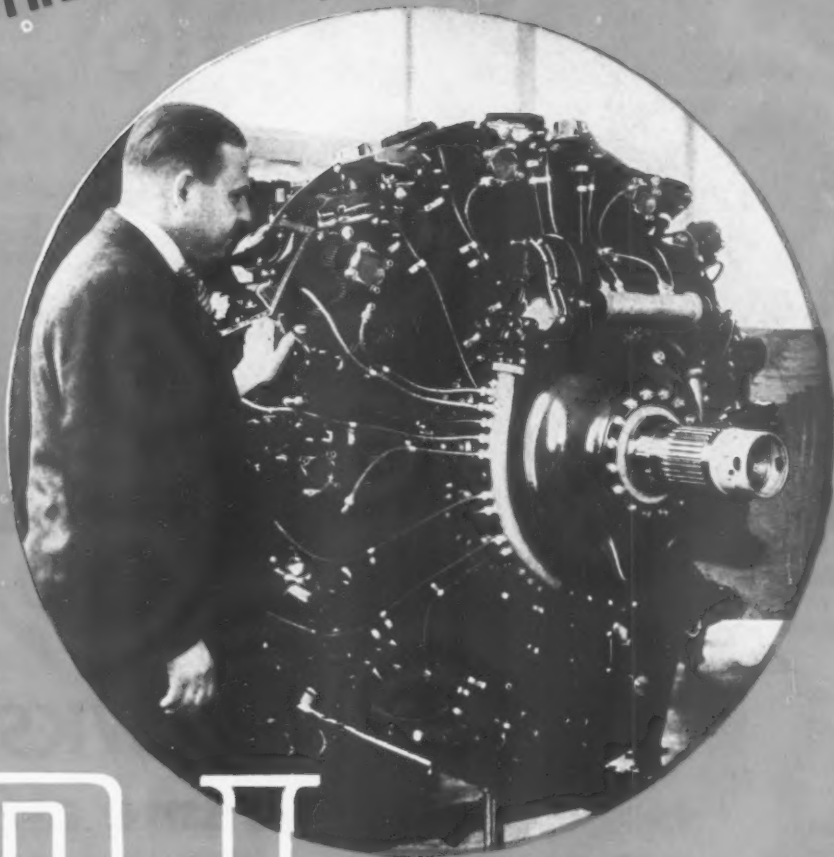
If your production includes pressure applications—write for details. An H-P-M FASTRAVERSE press will do the job faster and cheaper.

THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U. S. A.

District Sales Offices: New York, Syracuse, Detroit and
Chicago—Representatives in Principal Cities



THE BATTLE AGAINST TIME
is being won



with

P & J

Automatic CHUCKING EQUIPMENT

P&J engineering ingenuity is given a free rein when it comes to tooling up for duplicate parts production. Problems involved in the machining of parts for airplane engines, for example, can be handled with outstanding results in speed and accuracy, thereby making it possible to reduce the assembly time of these highly important power plants for our battleships of the air.

This speed-up, contributed by P&J equipment, applies also to parts for tanks, Belors guns, 90 mm anti-aircraft guns, machine guns, adaptors for shells, the American Aerlikon gun—in fact for a host of parts involved in offensive and defensive weapons of war. P&J's own production facilities are geared to the war effort to provide the machines which are contributing to the great successes being achieved in the Battle of Production.

Get more parts
there quicker
with more **WAR BONDS**

FOR VICTORY



BUY
UNITED
STATES
WAR
BONDS
AND
STAMPS

The POTTER & JOHNSTON MACHINE CO., Pawtucket, R. I.



... and then the "TOMAHAWKS" came a-flying

YOU'VE READ many stories about how the Tomahawks licked the ME-110s, the Focke-Wulff 190s and Tojo's Zeros. But the chances are you've never heard how **"TOMAHAWKS"** helped to win one of the war's biggest battles.

These Tomahawks were not the Curtiss fighter planes known to every schoolboy of the United Nations, but Genesee **"TOMAHAWK"** cutting tools which—on the production front—have helped to win our first big battle, the battle of production.

These Tomahawks have come a-flying by the thousands and tens of thousands out of Genesee's three plants in Michigan's little town of Fenton. They tackle the toughest babies in the way of steels and bronzes and aluminum. Their pilots have not always been experienced—but these **"TOMAHAWKS"** like their flying namesakes have kept on and are keeping on cutting away, day after day and week after week—as part and parcel of the greatest production offensive success the world has ever known.

There is another battle Genesee has been helping to fight: The War on Waste. Its poster series—free to metal working plants in war industry—has been teaching workers the importance of conserving the vital materials used in cutting tools.



GENESEE TOOL COMPANY

F E N T O N , M I C H I G A N

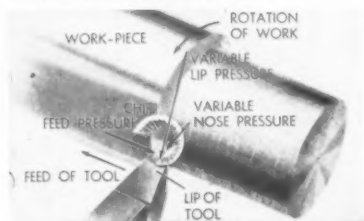


★ Registered
Trade Mark

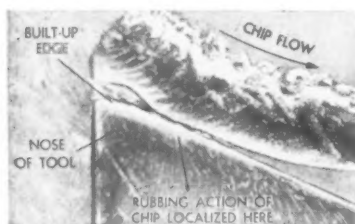
THE TOOL ENGINEER

How Cutting Oil Can Increase Your Production:

1 FACTS ABOUT METAL CUTTING



The lip of a tool is an *extreme-pressure* area where the great pressures of the chip are exerted. At the tool nose and directly below the cutting edge is a *boundary area* which intermittently contacts the work-piece as the tool is deflected by the varying pressure of the chip. These microscopic vibrations create minute openings permitting a properly selected cutting oil to reach the pressure areas.



The *built-up edge* (see above) protects the cutting edge of the tool from frictional heat and excessive wear. An excessive build-up, however, results in its sloughing between tool and work-piece, thus marring the finish.

2 WHAT CUTTING OILS MUST HAVE (FOR GENERAL MACHINING)

PRESSURE RESISTANCE

Adequate pressure-resisting property in a cutting oil prevents excessive heating and wear of cutting tool and promotes smooth chip flow. **RESULT:** *Maximum feeds and cuts...minimum vibration...satisfactory finish.*

ANTI-WELD

Correct anti-welding property prevents excessive amount of built-up edge which can slough between tool and work, but fosters the necessary slight build-up which protects the cutting edge. **RESULT:** *Satisfactory finish and long tool life.*

LUBRICITY

Correct lubricity protects the boundary area of the tool from excessive wear. **RESULT:** *Long tool life...accurate size...smooth finish.*

COOLING ABILITY

Maximum cooling ability to remove frictional heat. **RESULT:** *Maximum speed...long tool life.*

3 PRODUCTION BENEFITS FROM USING S/V CUTTING OILS:

S/V Cutting Oils are the highest quality obtainable for the service for which they are recommended. They have a correct balance of essential cutting oil properties and their use results in...

✓ MAXIMUM CUTTING SPEEDS, FEEDS, CUTS—

i.e., a maximum amount of metal removed per minute.

✓ MAXIMUM PRODUCTIVE MACHINE TIME—

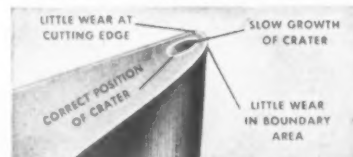
i.e., minimum shut-downs for tool replacements.

✓ MINIMUM REJECTS—

due to poor finish or off-size.

Plus

✓ TOOL CONSERVATION



The picture above shows the best position of the crater on the lip of the tool. It results in the need for removing only a minimum of metal per grind. If finish and tool life are satisfactory, this is the ideal condition.



SOCONY-VACUUM OIL COMPANY, INC.—Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Magnolia Petroleum Company • General Petroleum Corporation of California

USE S/V CUTTING OILS

S/V VACSUL • S/V SULTRAN • S/V VACMUL



If Nazis were penguins...

IMAGINE ARMIES of penguins goose-stepping all over the South Pole! Heil, Pengler!

But penguins aren't birds of prey. They're just simple fishermen. They'd never yearn for other people's territory. Even if they enjoyed goose-stepping, they'd confine their marching to the Antarctic.

Suppose the situation were reversed. What if penguins were Nazis? They'd certainly become dissatisfied with the South Pole. They'd start "protecting" their neighbors. And after a few peace overtures, they'd attempt a Polar blitzkrieg!

The moral? Just this: You can't make a plunderer out of a penguin, and you can't make a nobleman out of a Nazi. So long as there are Nazis in the world, men cannot be sure of being free.

That's why we must war to the death against the Nazis. In doing so, we must lean heavily on our machine tool industry. We can lean with confidence. This miracle-making industry has overcome Germany's 7-year head start in about a year. And today, for every one machine tool produced by the Nazis, we are producing 5!

A potent factor in this production miracle has been the Multiple Spindle Automatic Lathe made by Cone. These production titans of the machine tool industry are currently used in the production of parts for guns, tanks and planes.

Remember that name—Cone Multiple Spindle Automatic Lathe. It will continue to make history after victory is won!

CONE Automatic Machine Company, Inc., Windsor, Vermont

BETTER *Bite*
FOR PROPELLERS



**HOW HEALD ENGINEERING
SOLVED A WARTIME PROBLEM**

The propellers of a sharply climbing "Thunderbolt" bite off chunks of air — the way you bite into your favorite pie — in increasing amounts varied by pitch control from low pitch for take-off and climb to high pitch for maximum speeds. To change the "bite" or pitch of propeller blades they turn axially on bushings in the blade shanks — seats for which have to be true and accurate but difficult to produce.

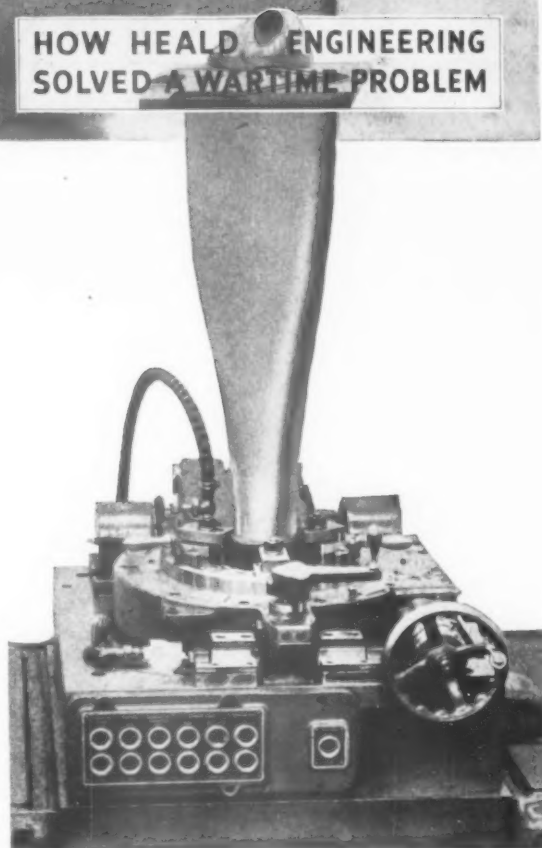
These bushing seats are a tapered hole requiring accuracy to .0002" and taper to .00025" in 6 inches. Roundness and straightness have to be perfect for full bearing. Attempts to do the job by reaming and hand scraping proved unsatisfactory. New methods had to be found.

HEALD ENGINEERING solved the problem . . . solved it so satisfactorily that propeller blade seats of uniformly high precision are now produced at 1700% greater production. Propeller blades are held vertically on the Heald Bore-Matic specifically designed for this job . . . the rotating single-tool boring quill moves upward and angularly from below to generate a perfectly true seat.

Have you a wartime problem or do you need assistance in postwar planning? If it involves precision finishing, HEALD ENGINEERING is available, now, to help you.

The HEALD Machine Co., Worcester, Mass.

For More Precision Faster, bring your problems to Heald



As shown above the propeller blade is held stationary in a vertical position and the 3.2500" diam. 6" deep taper seat is generated from underneath by an angularly rotating boring bar. The fixture member is pivoted at the rear and is raisable, thus giving access for checking the bored hole as well as access to the boring bar.



TOOLS for TODAY and TOMORROW

The modern cutting tools that are setting new production records today, and the gages that control this production, insure new and better products for all industry in the years to come.

When these gages and tools carry the PM Diamond emblem, you may be doubly sure of their quality and accuracy.

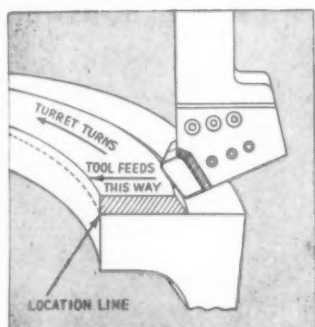
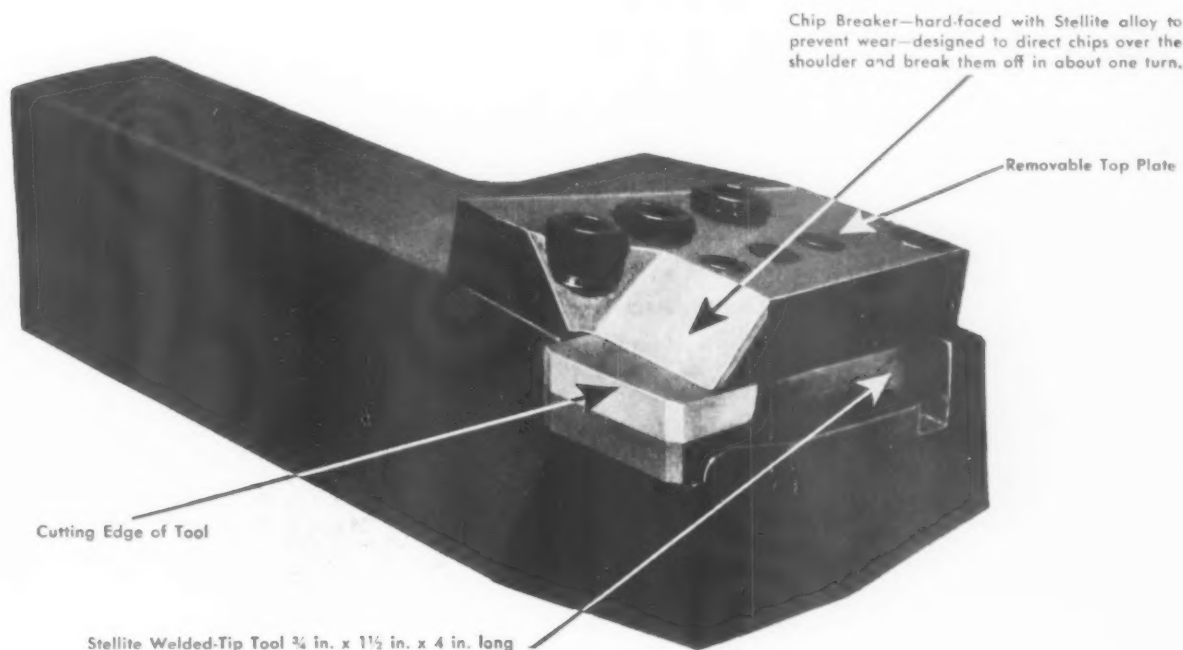
Have you the latest PM Catalog on your desk?



The PIPE MACHINERY COMPANY Cleveland, O.

GAGES • HOBS • MILLING CUTTERS • SPECIAL TOOLS

This Tool Holder uses small Stellite tools on big jobs and cuts tool cost and grinding time



The tool holder shown above holds a Stellite-tipped tool for rough machining the bottom face of the cast armor steel tank turret as shown in the simplified cross-section sketch at the left. Surface speed is 65 ft. per min.; feed is 0.040 to 0.060 in. per rev.; and the depth of the cut varies from $\frac{3}{8}$ in. to more than 1 in. Holders for both right- and left-hand heads of the machine use identical tool bits.

bits. Adjustment of the tool to compensate for wear is in the line of wear, so tool life is considerably prolonged.

Full Cutting-Edge Support

Tool breakage is reduced to a minimum because this holder supports the tool directly under the cutting edge. This support permits full utilization of the heavy feeds and deep cuts that Stellite tools can take. Since the tool is wider than the deepest cut encountered in this work, only one corner of the cutting edge of the tool is working at a time. A dull tool, therefore, can be turned over and used in the opposite head without being reground.

Detail Drawings Available

Haynes Stellite Company does not make or sell this holder. But if you believe that Stellite tools and holders of this type would be useful in your work, further information—and detail drawings of the holder—can be made available without cost.

BUY UNITED STATES WAR BONDS AND STAMPS



HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York 17, N.Y.



Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

HIGH-PRODUCTION METAL-CUTTING TOOLS

"Stellite" is a registered trade-mark of Haynes Stellite Company.

DECEMBER, 1943



TOO MUCH, TOO SOON

FOR THE AXIS!

In only four short years, the American machine tool industry has built more tools than were produced in the previous forty. They're better tools, faster, more accurate, easier to operate.

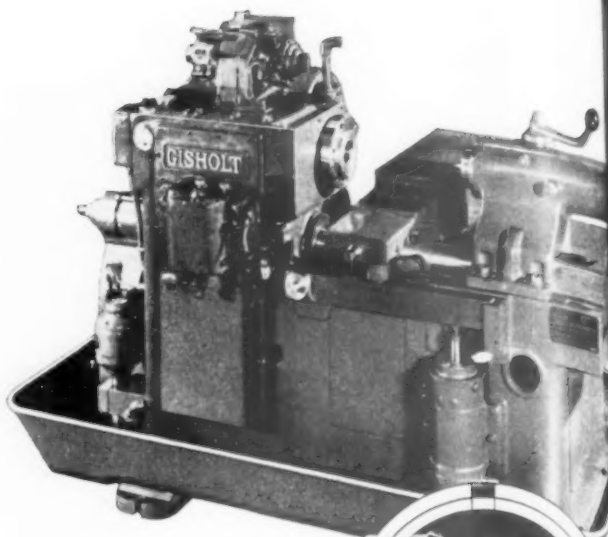
Today, they're all working in essential war industries. They're winning the battle of machines against machines. You may be confident that they're helping America create an irresistible striking power that our enemies will never match.

GISHOLT MACHINE COMPANY

121½ East Washington Avenue • Madison, Wisconsin

Look Ahead . . . Keep Ahead . . .

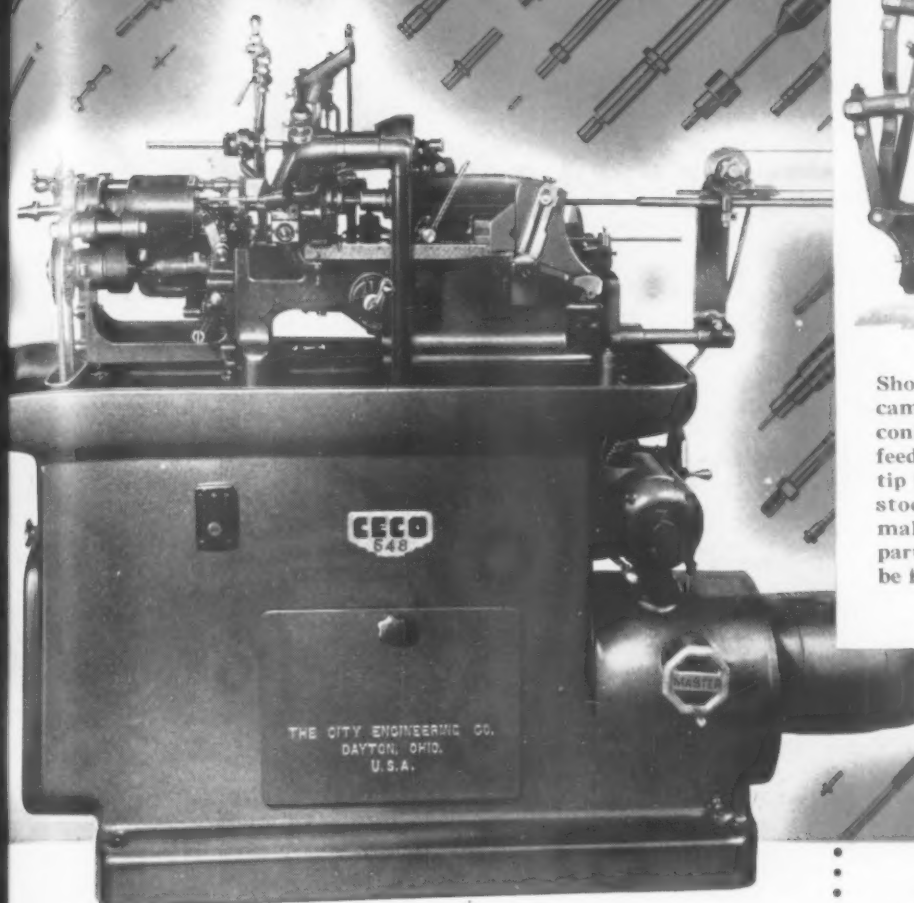
With Gisholt Improvements in Metal Turning



THE GISHOLT AUTOMATIC HYDRAULIC LATHE requires so little attention that one man (or woman) can tend two or three machines. Easy tool set-up and adaptability to handle a variety of work, make it practical to use its high machining speeds even in small lot production.



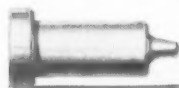
TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES



Ceco gives One-Operation
PRECISION PRODUCTION
 of Intricate Parts with Single Tip Tools

CECO REVOLUTIONIZES
 THE MASS PRODUCTION
 OF EXTREMELY ACCURATE
 HIGH FINISH PARTS

America's bellwether makers of precision instruments have found that CECO Automatic Screw Machine offers them economy, accuracy and a finish precision production of intricate parts, such as those shown on this page, undreamed of with conventional screw machines.



DIESEL SUBMARINE ENGINE PART
CECO-MADE IN ONE OPERATION

This part was generated in one operation to extremely high finish without grinding, using single tip tool, which leaves no tool or chatter marks as with formed tools.

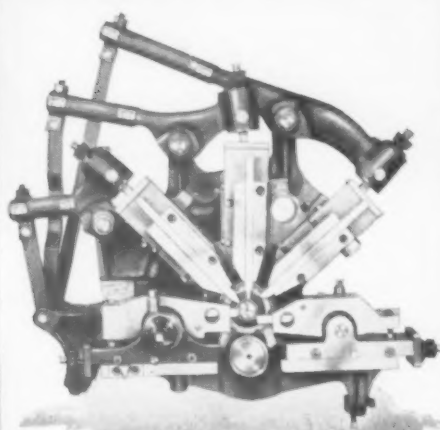
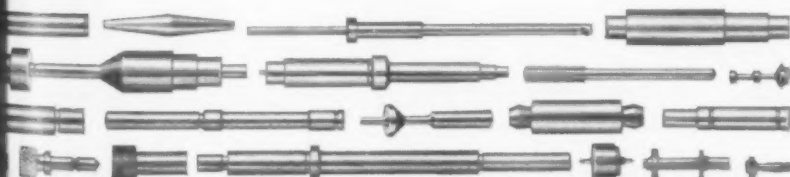
MATERIAL: Tough alloy steel.

DIAMETER: Extremely close tolerance.

Write For Complete Illustrated Data

THE CITY ENGINEERING COMPANY ★ DAYTON, OHIO

Since 1909, Designers and Builders of Tools, Dies,
 Jigs, Fixtures, Gages and Special Machinery



Shown is the CECO tool head with 5 cam-actuated radial tools and a cam-controlled sliding headstock which feeds the bar stock past the single tip tools. This coordination of headstock and tool slide movements makes possible the production of parts, the diameters of which can be held within the limits of .0003 on production work.

Highlight Features!

BAR CAPACITY: Available in $\frac{3}{8}$ " and $\frac{1}{2}$ " bar capacity.

4 or 5 RADIAL TOOL SLIDES.

MAXIMUM TURNING LENGTH: 4" with flat cam.

MASTER SPEED RANGER: Varies Spindle speed from 675 to 7500 R.P.M. at the turn of a handwheel.

PRECISION ROLLER BEARING SPINDLE: Always in adjustment.

CONSTANT RISE FEEDING MECHANISM gives extreme feeding accuracy.

CECO

SWISS TYPE

Automatic

**UNIVERSAL PRECISION
 SCREW MACHINES**

THREE MODELS. — 4-3-B, 5-3-B, 5-4-B

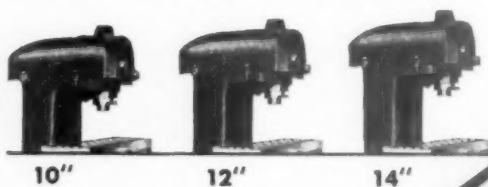
New!

Close-Coupled

FOR TOP-SPEED MILLING!



**KENT-OWENS 2-20V VERTICAL MILLER
BUILT WITH 3 GAPS**



42" by 12" Table . . .
20" Table Travel . . .
Hydraulic Table Feed

★ With the new Kent-Owens No. 2-20V Vertical Milling Machine you can start milling jobs *right* . . . with the *right* gap for greater rigidity and top-speed production.

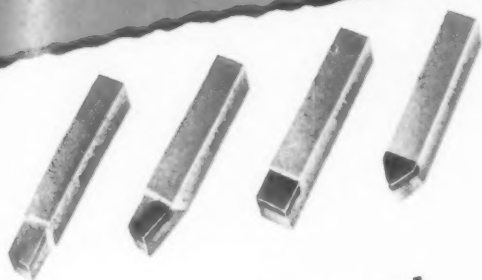
This machine is furnished at the factory with any one of three gaps from table to spindle nose. The base machine has a maximum gap of 10" . . . maximum gaps of 12" or 14" are available . . . each having 4" vertical quill adjustment. This close-coupled construction provides unusual rigidity and thus permits using maximum feed rates. Send for new bulletin. Kent-Owens Machine Co., Toledo, Ohio.

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON General Machinery Corp.	KANSAS CITY Eichman Machinery Co.	PHILADELPHIA Calco Machinery Company
BUFFALO Don W. Patterson	LOS ANGELES Eccles & Davies Machinery Company	PITTSBURGH Barney Machinery Co.
CHICAGO Neff, Kohlbusch & Bissell	HARRISON, RICKARD & McCONE	ROCHESTER F. W. Schiefer Machinery Company
DALLAS Hamilton-Huster Machinery Co.	MILWAUKEE Neff, Kohlbusch & Bissell	SAN FRANCISCO C. F. Bulotti Machinery Co.
DAYTON Gosiger Machinery Co.	MINNEAPOLIS The Satterlee Company	SEATTLE Star Machinery Company
DETROIT A. C. Haberkorn Machinery Co.	MOLINE John J. Normoyle Co.	ST. LOUIS Blackman & Nuetzel Machinery Company
GRAND RAPIDS Joseph Monahan	MONTREAL F. F. Barber Machinery Co.	CLARKE EQUIPMENT CO.
HOUSTON Oliver H. Van Horn Co., Inc.	NEW ORLEANS Oliver H. Van Horn Co., Inc.	SYRACUSE J. F. Owens Machinery Co.
INDIANAPOLIS Oatis-Booth Machinery Co.	NEW YORK Wilson Brown Company	TORONTO F. F. Barber Machinery Co.
		WALKERVILLE F. F. Barber Machinery Co.

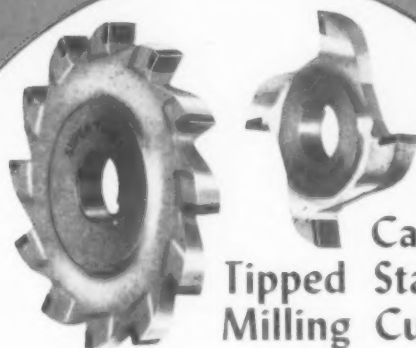
Call on **KENT-OWENS**
for Milling Machines

STEP UP PRODUCTION — STEP DOWN COSTS ... WITH SUPER TOOLS!



Carbide Tipped Standard Tool Bits

For turning, boring or facing these single point tools are extremely efficient when machining all materials including hard steels. They cut fast, clean and true. The need for annealing and straightening in many cases is eliminated. Low heat absorption means less pitting when cutting soft steels. Write for descriptive literature and prices.



Carboboly Tipped Standard Milling Cutters

For faster production, greater accuracy and money-saving economy on all types of milling jobs—cast iron and non-ferrous materials as well as steel. Available in 3" to 8" diameters with 4 or 6 flutes for cast iron, brass, bronze, copper, aluminum, magnesium and plastics. For steel 6 to 16 flutes are used according to diameter. The low cost of these milling cutters permits their use on short as well as long runs. Write, wire or phone for details and prices.



Carbide Tipped Standard Reamers

These extremely fast, true and clean cutting solid type standard reamers are available with either a straight or tapered shank. They have proved their ability to hold their size over long runs on all types of reaming jobs. Available from stock in many standard sizes and in semi-finished form for quick completion to your specifications. Details and prices on request.



Carbide Tipped Special Tools

Super Tool Engineers, backed by years of experience and unequalled laboratory resources, stand ready to develop special Carbide tipped tools to bring greater efficiency and economy to your specific production jobs where standard tools do not fully serve. Whatever your special job, send us your prints and specifications for recommendations and estimates.

SUPER TOOL COMPANY

21650 Hoover Road, Detroit 13, Michigan

★ 4105 San Fernando Road, Glendale 4, California

Carbide Tipped Tools

FOR TURNING • FACING • REAMING • SPOTFACING • BROACHING
FORMING • GRINDER RESTS • WEAR PARTS • BORING • MILLING • DRILLING
GROOVING • COUNTERBORING • SHAVING • CENTERS • SPECIAL PURPOSES



DON'T LET A WORN BEARING SABOTAGE THE WHOLE TOOL

IF bearings of HIGH-CYCLE tools are not replaced when worn, the working parts of the motor rub, causing expensive repairs, interrupting production and perhaps permanently reducing the power of the tool.

Since they're comparatively cheap, they should be replaced when they show appreciable wear. Here, the old adage certainly applies, "A stitch in time saves nine".

How do you tell when a bearing is worn dangerously? This is discussed on Page 5 of the Rotor Maintenance Manual, "Keep 'em Working". This guide gives pointers on all aspects of HIGH-CYCLE tool care. Concisely written and easy to understand. A condensed version also is available in a wall chart for handy reference in the shop. These . . . or similar, on AIR tools . . . are yours for the asking.

Subjects Discussed in "Keep 'em Working"

How Often Should Tools Be Inspected?
What To Do When Tools Are Inspected.
Correct Amounts of Grease To Use.
Ball Bearings—Replacement and Care.
Switches—How To Prolong Their Life.
Care and Repair of Cable.
Causes of Stator Troubles and Overheating of Tools.
How To Order Spare Parts.
Selection of Frequency Changers.
"Shorts", "Grounds", Single-Phasing.
Fusing For Peak Output.
Safety Rules.

Manual or chart, free on request.

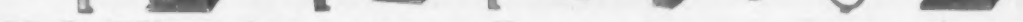
AIR

THE **ROTOR TOOL** CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

HIGH
CYCLE



14½" South Bend Lathe
Bed Lengths: 5' to 10'

13" South Bend Lathe
Bed Lengths: 4' to 7'

Series 1000 South Bend
Turret Lathe, 10" Swing

9" South Bend Lathe
Bed Lengths: 3' to 4½'

10" South Bend Lathe
Bed Lengths: 3' to 4½'

16" South Bend Lathe
Bed Lengths: 6' to 12'

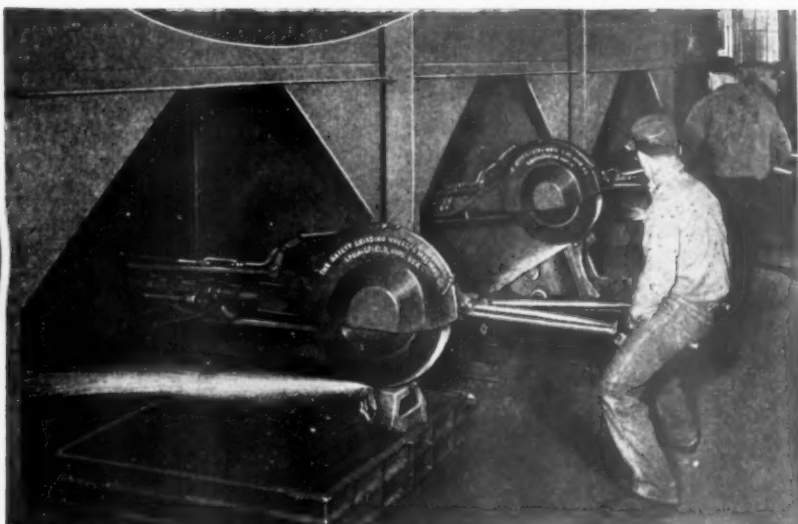


Commandos

OF THE PRODUCTION FRONT

SAFETY GRINDING WHEELS

SPEEDING PRODUCTION REDUCING COSTS



Thousands of important war plants throughout the nation are calling on Safety for Grinding Wheels for 24-hour COMMANDO duty to maintain production at highest possible levels. Faithfully and efficiently Safety Wheels are performing every difficult task at exceptionally high speeds. Whether the job is one

calling for a very large wheel for rough work, or the very smallest wheel for intricate precision work, Safety has the specific Wheel for the job at hand. And Safety's nine major distributing centers and twelve sales offices in key war production centers assures fastest kind of delivery and service.

FOR GRINDING WHEELS THAT INSURE HIGHEST OUTPUT, BEST FINISH, AND GREATEST ECONOMY, PHONE THE NEAREST SAFETY SALES OFFICE, OR WRITE FACTORY DIRECT

THE SAFETY GRINDING WHEEL AND MACHINE CO.

Main Office and Factory • Springfield, Ohio • Phone 4651



THE TOOL ENGINEER

ILLINOIS TOOL *Inspection*



The machine illustrated is the Universal Hob and Worm Measuring Machine. Other Illinois Measuring Machines include:

- Involute Profile Measuring Machine
- Base Pitch and Space Measuring Machine
- Helical Lead Measuring Machine
- Gear Charting Machine
- Universal Cutter and Hob Measuring Machine
- Hob Tooth Profile Measuring Machine
- Hob Lead Measuring Machine

Overnight to all America
... From the hub of
Air Transportation



WHERE EACH TOOL UNDERGOES STRICT CHECKING ON SPECIALLY DEVELOPED ILLINOIS MEASURING MACHINES!

To assure the exact accuracy of the finished tool, which is fundamental to dependable performance, Illinois Tool engineers developed many types of measuring machines for use as inspection equipment. These machines serve many different checking operations, such as: determining the accuracy of tooth profiles, helical leads and spacing of flutes.

Because of their exceptional accuracy and practicability, these machines are being used also in the inspection departments of leading metal-working plants throughout the nation.

Tools passing inspection on such equipment are certain to be accurate... are certain to give you the high quality of performance which careful tool buyers have learned to expect from Illinite Precision Metal-Cutting Tools!

ILLINITE

HOBBS • BROACHES

SHAPER CUTTERS • GEAR CUTTERS

MILLING CUTTERS • GROUND FORM TOOLS

SPECIAL TOOLS



ILLINOIS TOOL WORKS

Manufacturers of Metal Cutting Tools and
Shakeproof Products

2301 N. KEELER AVE., CHICAGO 39, ILLINOIS
In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

*When tolerances run
into fractional thousandths*

★ IT'S A JOB FOR A SIDNEY LATHE ★ ★ ★



Aside from its convenience of operation the outstanding reason for the continued accuracy of the Sidney Lathe is its smooth flow of power.

The superior qualities of continuous tooth herringbone gearing have long been recognized and are most successfully demonstrated in the Sidney Herringbone geared headstock.

Airplane manufacturers were quick to take advantage of this feature of Sidney Lathes—as verified by the large batteries of these modern machines now turning out thousands upon thousands of precision parts daily in a number of prominent airplane plants.

The machine illustrated is working day and night in the plant of a well known manufacturer of aircraft for our fighting forces.

In war as in peace you can depend upon Sidney accuracy.

Built in 14" to 36" capacities—adaptable to a wide range of applications. *Bulletins available on each model.*



The SIDNEY MACHINE TOOL Company
Builders of Precision Machinery

SIDNEY

ESTABLISHED 1904

OHIO



BOTTLENECKS

DAMN THE TORPEDOES FULL SPEED AHEAD!

Making only Mounted Wheels and small Grinding Wheels—maintaining highest quality in spite of large quantities and rush orders—shipping them promptly. ***This is our job, our battlefield.***

With full WPB approval, we stopped making all large size grinding wheels and fixed our sights on wheels 3" in diameter and under.

We worked all around the clock, 24 hours a day, and in a short time were able to fill orders on time—And, our central location cuts time in transit. Today, there is no waiting. With the Army-Navy E at our masthead, we are going full speed ahead.

AMERICA'S HEADQUARTERS FOR

**MOUNTED
WHEELS**

**SMALL
GRINDING
WHEELS**

Half a century of specialization has established our reputation as the Small Wheel People of the Abrasive Industry. You can bank on us.

TEST WHEEL FREE—To get acquainted with Chicago Wheels, let us send one postpaid. Tell us size wheel and material you wish to grind.

Write for illustrated catalog



CHICAGO WHEEL & MFG. CO.
1101 W. Monroe St., Dept. TF, Chicago 7, Illinois

Send Catalog. Interested in:

☐ Mounted Wheels ☐ Grinding Wheels ☐ Send Test Wheel. Size _____

Name _____

Address _____

Speeding Production of **ANTI-AIRCRAFT GUNS** *with* **CINCINNATI HYPRO BORING MILLS**



★ Here a Cincinnati Vertical Boring Mill is machining steel loader rods used in an anti-aircraft gun. Originally the loader rods, which are segments of a large circle, were manufactured from individual forgings.

Distortion during machining was met with. To avoid this the manufacturer rolled a bar of steel into a ring, butt-welded the ends, and then turned the ring on a Cincinnati Hypro Boring Mill.

The turning operations included:

1. Rough and finish-turn internal diameter and bottom of the ring surface.
2. Ring is laid with finished surface down on table fixture. Clamps are positioned against the finish-turned inside diameter, being careful to indicate the

part to 0.001 inches. Outside diameter is then rough and finish-turned.

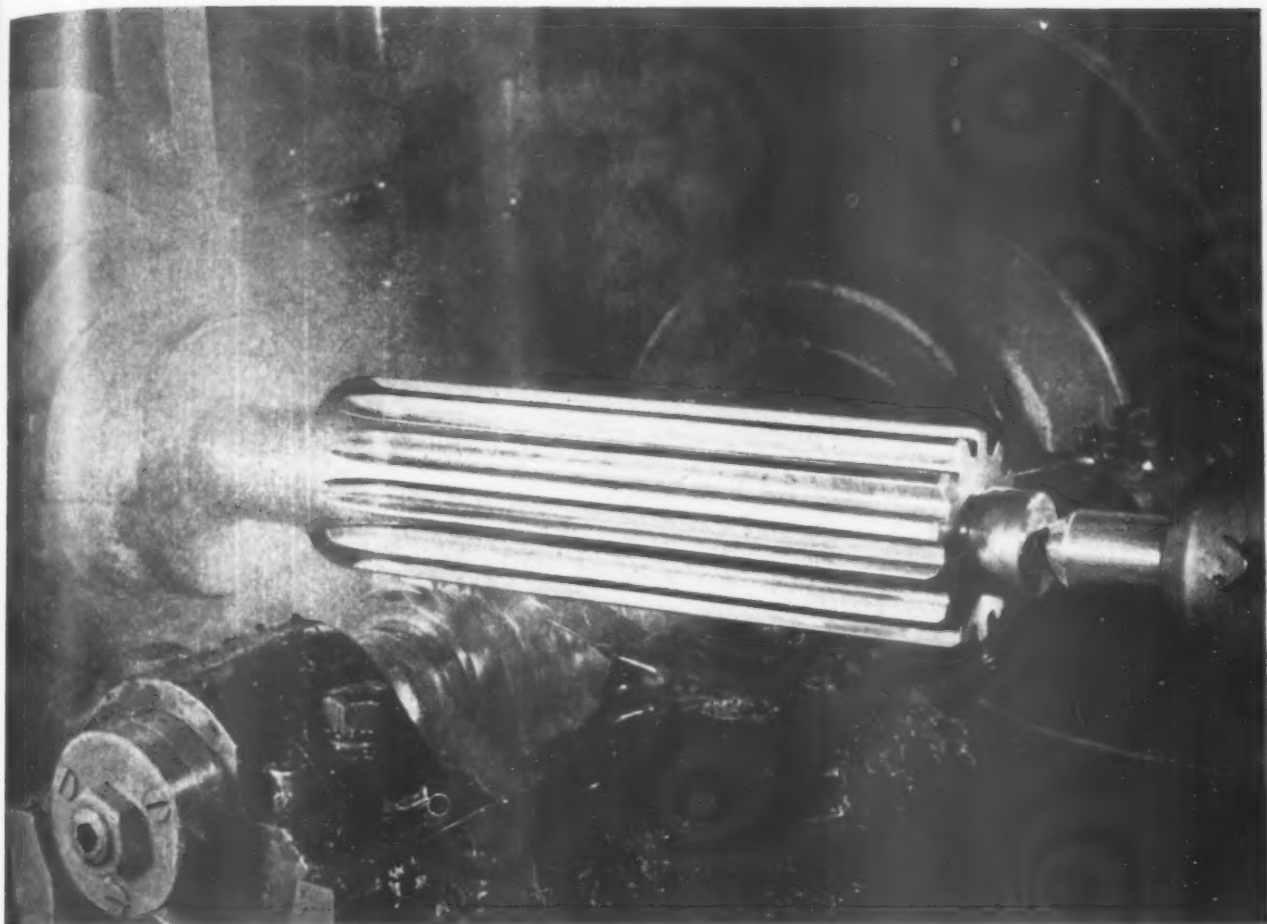
3. Additional clamps are placed on the finished outside diameter while semi-finishing the sides and floor of the channel section. Following this, sides are finished down to the floor.

4. Clamps are removed and over-all height of the piece and channel floor is finish-faced.

This method proved highly satisfactory—sped production and released critical machinery for other work. For hypro-duction—unfailing accuracy—versatility and ease of operation—specify the Cincinnati Hypro Vertical Boring Mill.

Write for complete information in Illustrated Bulletin 1307E.

THE CINCINNATI PLANER COMPANY
Planers...Vertical Boring Mills...Planer Type Millers
CINCINNATI . OHIO . U.S.A.



AS A RESULT OF CHANGING THE CUTTING OIL, CUSTOMER REPORTS 50% MORE PIECES PER HOB

THIS specific example of How To Conserve Cutting Tool Life has recently come to our notice. On two spline hobbing jobs in a transmission plant, the number of pieces per hob sharpening increased 50% as a result of changing the cutting oil. Thus, with the same number of sharpenings, each hob produced half again as many pieces as before, and there was a proportionate saving in set-up time as well. On one 10-key piece with splines $6\frac{1}{4}$ " long and $2\frac{1}{2}$ " diameter, pieces per grind increased from 16 to 24; on the other 10-key piece with splines $2\frac{1}{2}$ " long and $1\frac{7}{8}$ "

diameter, pieces per grind increased from 24 to 36!.. This is not saying that every job can be improved as much by the same method. But we do know there are many instances where a change of cutting oil might produce a substantial gain. Consult your cutting

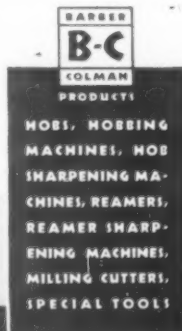
oil supplier — give him the facts, and give his recommendations a good trial. If you *do* make a saving, you are helping just that much toward conservation of vital cutting tools, and toward relieving the overload on cutting tool manufacturing facilities. *Your hobs are weapons — get the most out of them!*



CONSULT YOUR CUTTING OIL SUPPLIER...

He is equipped with specialized knowledge of what oil will get the best results. He is ready and willing to help in any way he can. *Give him a call!*

*Buy
War
Bonds*



Barber-Colman Company

GENERAL OFFICES AND PLANT • 213 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

With flexible shaft, with stationary set-up, or by hand SEVERANCE CUTTERS do the job cleaner, faster, easier



Because of their hardness, design and keen cutting edges, Severance Midget Milling Cutters speed up finishing time, easily do the job two to three times faster than any other type of rotary tool. They take deep, sharp bites and after the teeth are worn, can be successfully re-ground scores of times.



Left: A Severance Midget Milling Cutter being used in a stationary set-up, which many manufacturers of small parts have found to be a great time saver. The part is held in the hand, the tool is held in a chuck on any type of bench lathe, polishing unit or flexible shaft mounted in a vise.



Right: One of the Severance Hand De-burring tools. With a twist of the wrist this Cutter easily bites off the burr or sharp edge left by a drill or punch. Available in a wide range of sizes with radius, ball nose or angle. Write for complete facts on how Severance Midget Milling Cutters can help you speed up your cleaning and finishing operations.

Severance complete line of "Carbide" Midget Milling Cutters are now available.



Severance

SEVERANCE TOOL INDUSTRIES INC., SAGINAW, MICHIGAN. PLANTS IN LONG ISLAND CITY, NEW YORK; DETROIT, MICHIGAN; FORT WAYNE, INDIANA; CHICAGO, ILLINOIS; LOS ANGELES, CALIFORNIA.

SUNNEN PRECISION HONING MACHINE for Jobs Like These—



Range Handles any internal diameter from .185" to 2.625" without jigs or fixtures.

Accuracy Guaranteed accuracy to within .0001" — has often been held to .000025".

Finish Produces super-smooth finish of 2 to 3 micro-inches.

Price The initial cost is low, and it's economical to operate. Basic price —

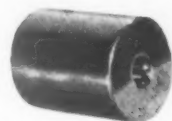
\$195⁰⁰



Compressor Yoke. Alignment maintained and better finish produced.



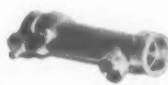
Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter—held to .0002", stock removal .001", sixty per hour.



Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.



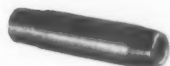
Shell Loading Die.



Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.



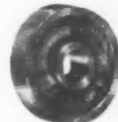
Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.



Cast Iron Valve Stem Guide. 1/2 to one thousandth removed—220 pieces per hour. Better finish and straighter hole.



Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.



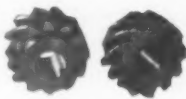
Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.



Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.



Aircraft Carburetor Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.



Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.



Carburetor Idler Valve Jet. Hole is honed after reaming for smooth action.



Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.



Bearing. A very small part, 2 micro-inch finish necessary.

SUNNEN

The Sunnen Precision Honing Machine has been found ideal for handling such parts as are illustrated above. No jigs or fixtures are needed, work is held in the hands. It often does the work of big internal grinders — relieves them for other jobs.

Skilled labor isn't necessary to operate the Precision Honing Machine. Girls in "teens can handle jobs in "tenths" within a few hours.

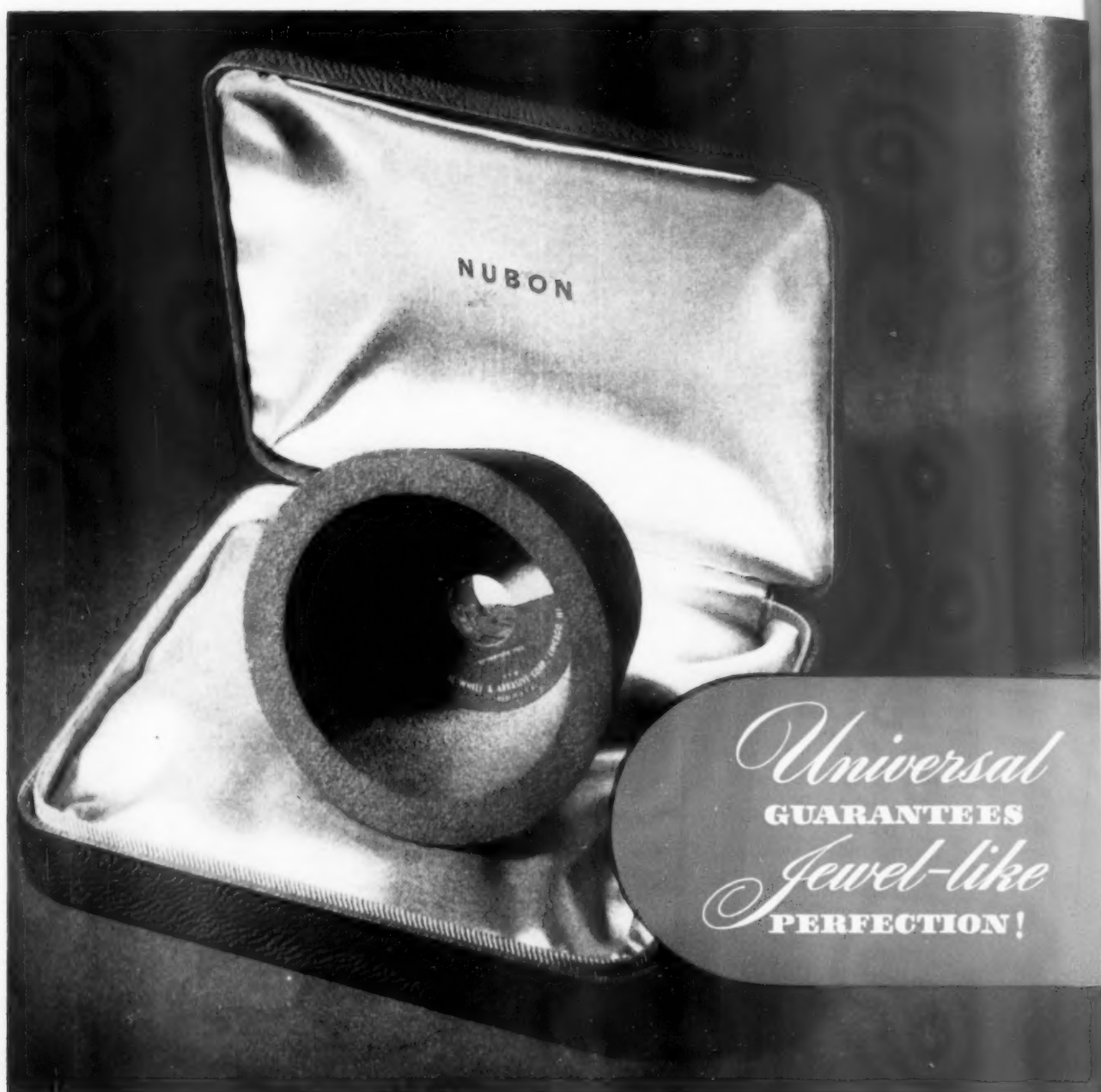
The greater accuracy and super-smooth finish assures absolute interchangeability of parts. It also assures fewer rejects — conserving vital materials and boosting production.

Write for complete information — or let a Sunnen engineer show you, in your plant, on your parts, what this machine will do.



The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

SUNNEN PRODUCTS COMPANY • 7932 Manchester Avenue, St. Louis, Missouri
Canadian Factory: Chatham, Ontario



Custom Made through our controlled trial plan, NUBON grinding wheels and stones are engineered to meet the most exacting requirements of War Production.

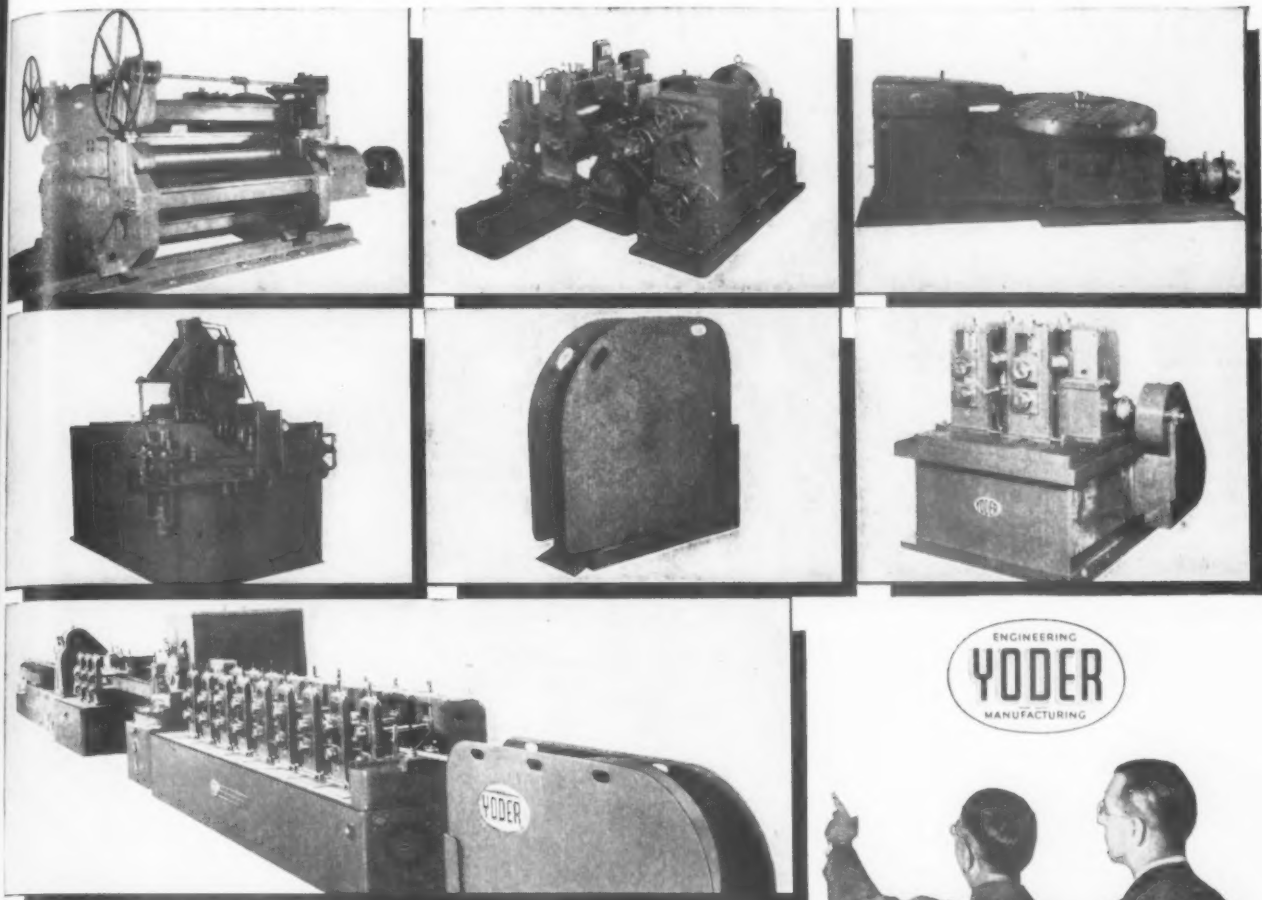
Speedy Delivery — made possible by our special bonding process — not only saves vital man-hours but also enables us to quickly solve your toughest grinding problems. Send for your copy of our new catalog.

UNIVERSAL WHEEL & ABRASIVE CORP.

2626 West Van Buren Street, Chicago, Illinois



THE TOOL ENGINEER



YES,

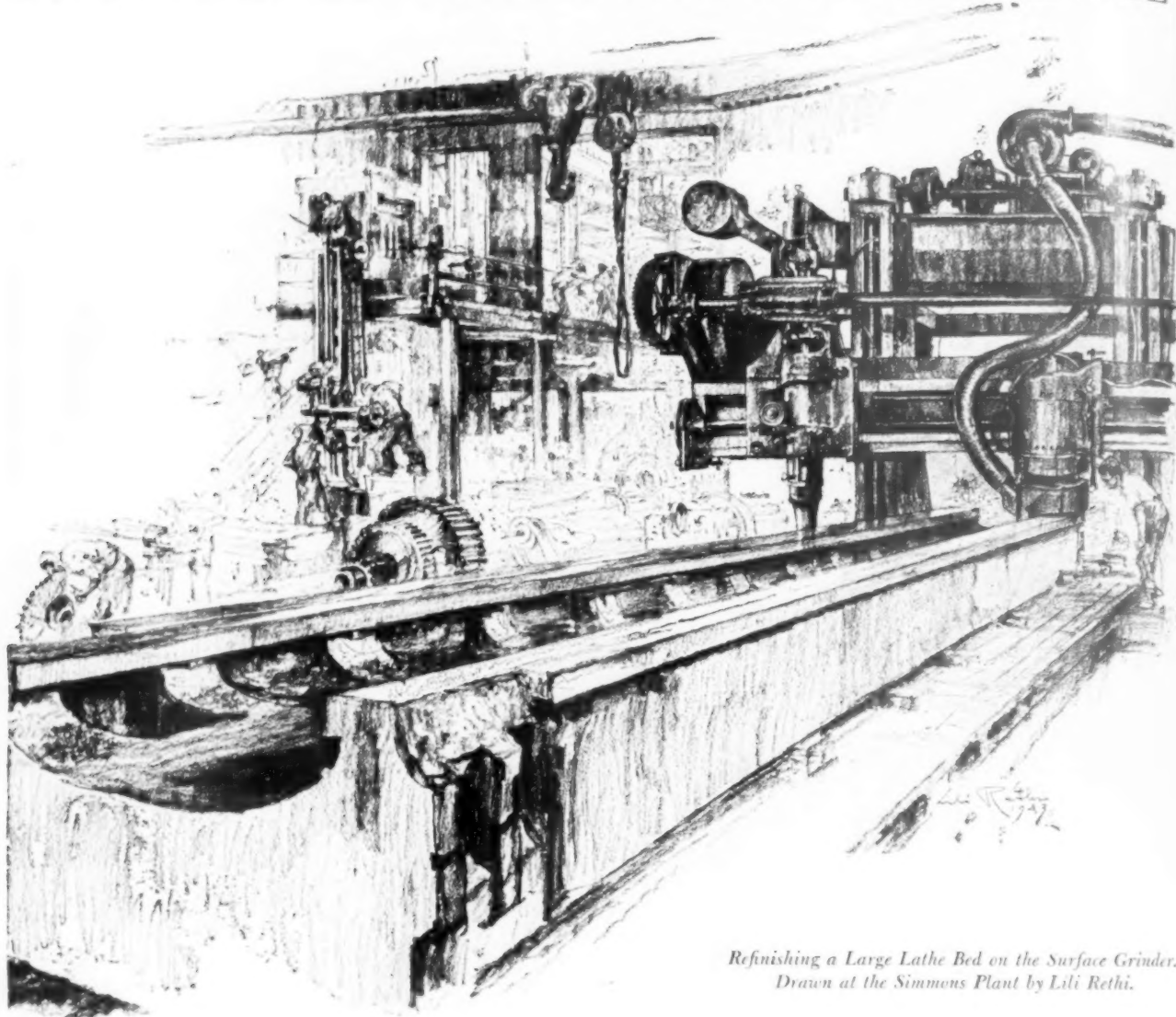
it's no "secret weapon" . . . everybody knows that when it's a YODER, it's a "GOOD" machine. When it is a "LATE" YODER, you can be sure it has a greater number of improvements designed and built into it, than any similiar type of machine. WHEN you plan, permit YODER organization to help with recommendations and quotations. Just send us your rough notes, blueprints and sketches, where metal working machinery is concerned . . . we'll go right to work! . . . and thanks for the opportunity. We have a catalogue for distribution, too.

THE YODER COMPANY • CLEVELAND, OHIO, U. S. A.

ENGINEERING
YODER
TRADE MARK
 MANUFACTURING

HIGH PRODUCTION METAL WORKING MACHINERY

FOUNTAIN OF YOUTH FOR A MACHINE AGE



*Refinishing a Large Lathe Bed on the Surface Grinder.
Drawn at the Simmons Plant by Lili Rethi.*

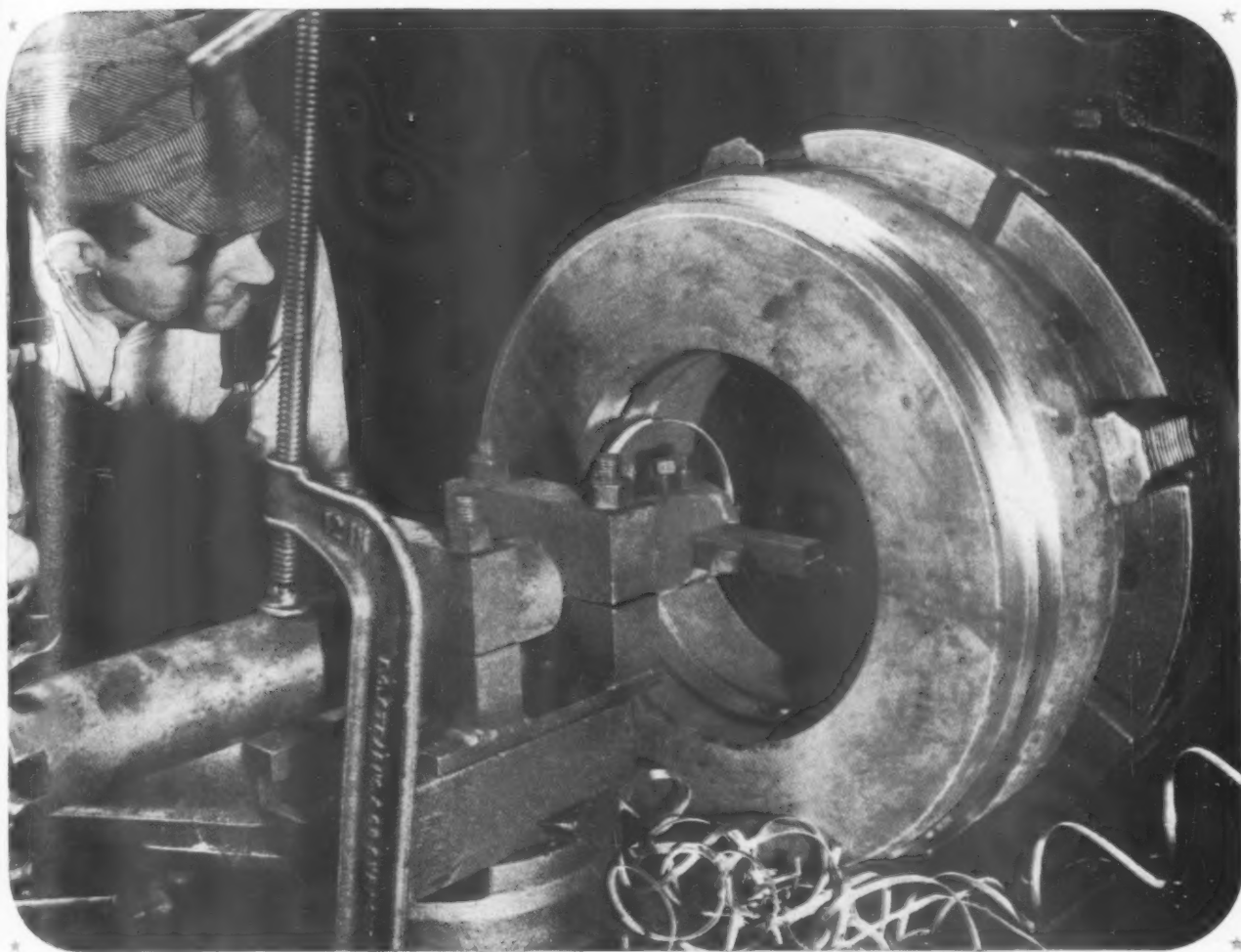
PONCE DE LEON came to the New World seeking a Fountain of Youth for the human race. He never found it. Medical science may yet.

In this same New World the machine has been developed to its maximum achievement. Mass production of commodities with the highest standards of precision is the American hallmark. The world's largest users of the products made from machine tools, the American people as a whole only now realize what they are, their significance in a world at war, and the peculiar difficulties involved in their manufacture; namely, that while machine tools make mass production possible, they cannot, in turn, be mass-produced. They are our master tools.

Machine tools, too, have a span of life, but for them engineers have created a unique Fountain of Youth... the Simmons plant for Engineered Rebuilding. Here machine tools of all types, sizes and ages throw off their years, return to work rejuvenated. The treatment: dismantling to the bare casting, all surfaces refinished by either grinding, planing or hand-scraping; all worn parts, such as gears, bushings and shafts, replaced with new; the machine then re-assembled along the same lines as followed by the original manufacturer and tested under power.

SIMMONS MACHINE TOOL CORPORATION
1810 North Broadway, Albany 1, N. Y.

SIMMONS *Engineered* REBUILDING



Ready Now FOR YOUR *Super* CUTTING JOBS ... *Super DBL* HIGH SPEED STEEL

NO COMPLICATIONS IN HEAT TREATMENT OR HANDLING

For any shop man familiar with the techniques used on tungsten cobalt steels, or on the 18-4-1 and tungsten-moly analyses, there will be nothing new in the handling and treatment of *Super DBL*. It also conforms to standard in the forms and finishes available, which include regular sizes of mill-treated tool bits and can be supplied from Allegheny Ludlum warehouse stocks, as well as distributors, in principal cities coast to coast.

ALLEGHENY LUDLUM mill technicians developed this new High Speed Steel to fill a dual role: first, to meet government requirements for the conservation of strategic materials; and second, to give you a higher degree of hardness and cutting stamina than has been previously available in steels which meet the conservation need.

Super DBL (a low-tungsten, molybdenum, cobalt steel) has been thoroughly tried and tested in service—it's ready to take on your heaviest-duty production work. Use it on hard, gritty castings—on heat treated alloy or stainless steels—on any rough and tough cutting job in the shop with full assurance of

maximum red hardness and performance. • For full data on properties, treatment and use, write for the "*Super DBL* Blue Sheet."

ADDRESS DEPT. TE-6



Allegheny Ludlum
STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

A-9074 . . . W&D

You'll get **BETTER SURFACE GRINDING**
with

DIAGONAL SHEARING

PRODUCTION TEST

Production Test Run on Hanchett No. 36 Vertical Surface Grinder with 36" dia. magnetic table. Wheel speed, 695 R. P. M.

WORK: Gears—cold rolled steel hardened: 7.51 sq. in. surface ground per piece; 45 pieces per table load.

CORTLAND

Brand Formerly Used

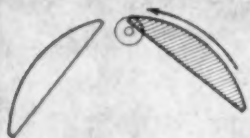
Cubic inches of stock removed per inch in height of segments
 Ampere Readings
 Dressings Necessary
 Work Heat?
 Grinding Time

76.5
 60 to 70
 None
 Cool
 8 min.

64.3
 70 to 80
 2
 Burned
 15 min.

Cortland shape Segments produced better finish with less wheel wear, and much faster grinding time.

DIAGONAL SHEARING



Shock and resistance minimized as narrow end of segment starts grinding action. Large surface still exposed to coolant. Diagonal motion of straight inner edge of segment produces powerful shearing action. Increasing contact combines rapid stock removal with minimum heating.



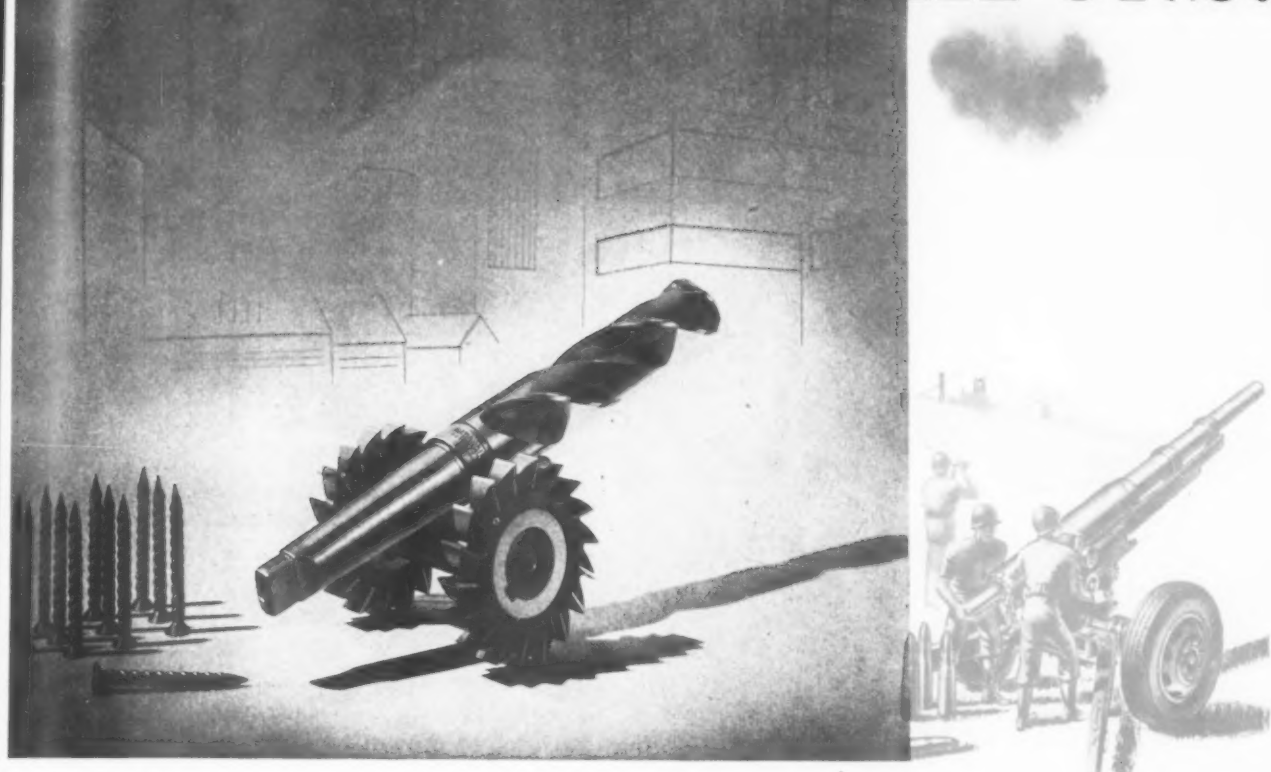
Maximum area of segment in contact with work momentarily. As segment continues to pass across work, grinding area becomes smaller, with more surface exposed to coolant.



CORTLAND

Segmental Chucks
 CORTLAND GRINDING WHEELS CORP. • CHESTER, MASS.

TOOLS ARE WEAPONS!



*N*ATIONAL cutting tools are *fighting* tools. They are built to take it—to stand up when the production pace is pressing.

Even the toughest tools produce more work with proper care. That's why the craftsmen who make National tools ask you to sharpen them regularly, be generous with the coolant. Work them hard but work them right!

NATIONAL



TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

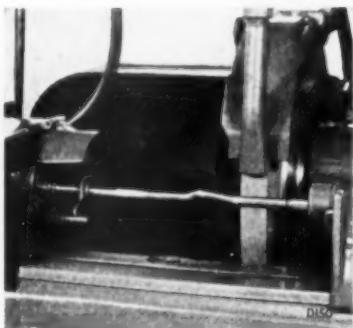
TWIST DRILL AND TOOL COMPANY

HOME OFFICE AND FACTORY—DETROIT, MICH.

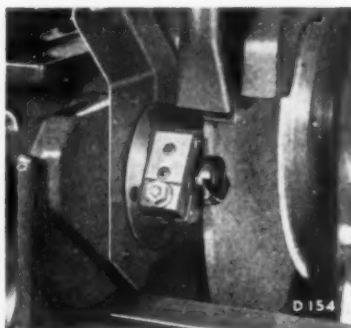
Tap and Die Division—Winter Brothers Co., Wrentham, Mass.

Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities

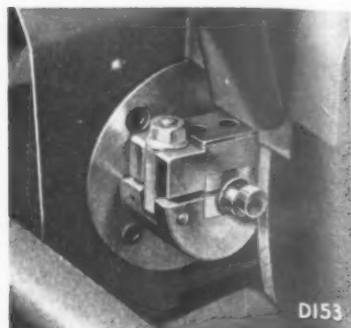
To Finish The Job Quicker . . .



D-150:--Standard Landis 6"x18" Type C Plain Grinder ... between center grinding an arm rotary shaft.



D-154:--Same machine ... special live spindle headstock ... grinding the eccentric of a hook.



D-153:--Same machine ... same headstock ... different (indexing) chuck ... grinding 2 eccentrics of a main shaft.

USE TWO HEADS INSTEAD OF ONE

.. LIKE THIS ..



The Landis 6"x18" Type C Plain Hydraulic Grinder. This high production grinder is being used for the grinding of 3 different parts.

A certain manufacturer wanted to grind 3 totally unlike parts on the same machine at a high rate of production. This is what he did.

First, he installed a Landis 6"x18" Type C Plain Hydraulic Grinder. On it such parts as arm rotary shafts (D-150) are ground between centers, using the standard dead spindle headstock. Then a special live spindle headstock is placed on the work table to the right of the standard head. With the aid of a chuck the eccentric of a hook (D-154) is ground. By merely changing to a second indexing chuck and using the same special head 2 eccentrics of a main shaft (D-153) can also be ground.

This combination of a standard high production grinder plus proper additional equipment saves valuable time. Can't you benefit by something similar?

*Unusual Performance
As Usual*



LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA.



**MICROSPHERE
WHEEL SPINDLE
BEARINGS**



**MULTI-SPEED
HYDRAULIC
TABLE
TRAVERSAL**



**HYDRAULIC
STRAIGHT
INFEED**



NICKEL AIDS THE CONSTRUCTION INDUSTRY *to KEEP 'EM WORKING!*

Engineers who design construction equipment can take pride in the construction industry's greatest achievement...its part in building America's "Arsenal of Democracy."

For they contributed to that amazing success, even long before the war started. They designed the tools with which the job was done...found ways to make equipment durable, and thus prevented many a breakdown of machinery at this critical time when nothing must interfere with the drive toward Victory.

Familiar to them, as a means of giving longer life to construction equipment, is the widespread use of Nickel Alloys. Those engineers have learned from long experience that Nickel imparts toughness, strength, and corrosion resistance to ferrous and non-fer-

rous metals, and thus assures improved performance under the most severe conditions.

Among them, as with men in many other industries, the saying is that "a little Nickel goes a long way" toward increasing dependability of machine parts—from gears to scraper blades, from dipper teeth to crusher rolls.

The experience of contractors, engineers, and machine operators in the field supports this conviction of the designing engineers...proves that the products of leading manufacturers stand up longer under the stress of exacting service.

It has been the privilege of INCO engineers and metallurgists to cooperate with the construction industry for many years. To men in all industries who desire assistance in the selection, abrica-

tion, and heat treatment of ferrous and non-ferrous alloys, the International Nickel Company cordially extends an offer of counsel and data.

New Catalog Index

New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects—from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?



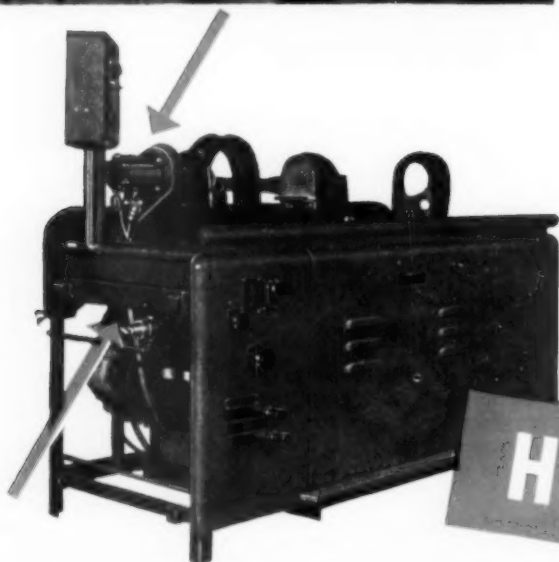
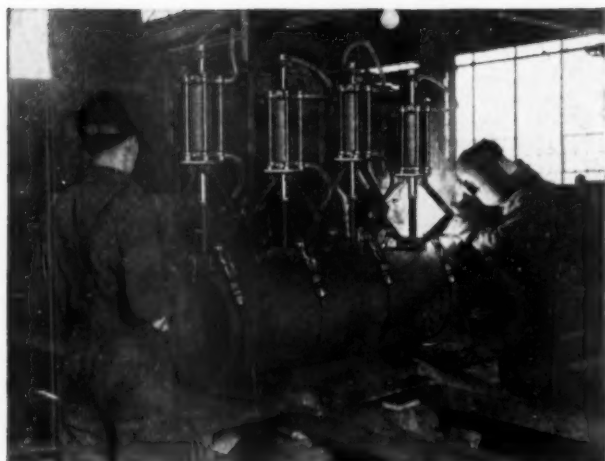
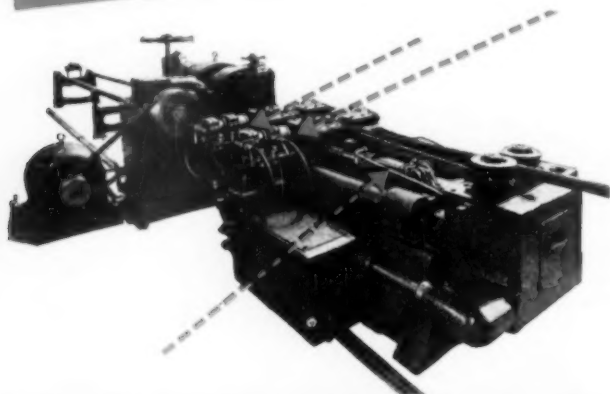
★ *Nickel* ★

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall St., New York 5, N. Y.

DECEMBER, 1943

61

SMOOTH, POWERFUL ACTION AND EFFORTLESS CONTROL



WITH **HANNIFIN CYLINDERS**

Production is being increased and handling simplified in a great variety of operations through the use of Hannifin Cylinders. Power movement of almost any kind can be easily provided, with smooth action, and simple control. Hannifin precision cylinders, with bored and honed cylinder bodies, assure maximum power and long life with minimum maintenance.

In this Medart Centerless Bar Turning Machine, Hannifin hydraulic cylinders are used to operate several clamping mechanisms.

Bomb bodies clamped in position for tack welding are held in this fixture operated by Hannifin pneumatic cylinders. A touch of the control valve closes the butt joint in the cylindrical bomb body and holds a piece in place while the tack welds are applied.

A Hannifin pneumatic cylinder is used to move the left-hand contact plate, clamping the piece to be inspected in this Magnaflux magnetic metal inspection unit. The clamping pressure may be varied to suit different parts by adjusting the Hannifin pressure regulating valve.

Write for bulletins giving complete data on Hannifin cylinders, or consult Hannifin engineers for specific recommendations.

HANNIFIN MANUFACTURING COMPANY

621-631 South Kolmar Avenue • Chicago 24, Illinois

Detroit Representative: R. A. Bean, Hayward Building, 4829 Woodward Ave.
Telephone Columbia 4949

Write for bulletins giving complete specifications of Hannifin products: Hydraulic Presses, Bulletin 60; Pneumatic Cylinders and Air Control Valves, Bulletin 57; Hydraulic Cylinders, Bulletin 35; Pneumatic Arbor Presses, Bulletin 46; Quenching Press, Bulletin 55; "Allen" Pneumatic Riveters, Bulletin 43; "Hy-Power" Hydraulic Riveters, Bulletin 53; Air Pressure Regulating Valves, Bulletin 56; Pneumatic Vises, Bulletin 59.

HANNIFIN

PNEUMATIC AND HYDRAULIC CYLINDERS

PRODUCTION PERSPECTIVES

T.M. REG. U.S. PAT. OFF.

WAR PRODUCTION: Arms output soared in October, scoring its biggest gain since April. Overall rise was 5 per cent, with aircraft up 10 per cent, ships up 5 per cent, ammunition up 11 per cent, and communications up 9 per cent. Arms output now is 6 times greater than when U.S. declared war.

AIRCRAFT: Big news on the production front came from aircraft plants, where a record 8,362 ships were produced in October. Schedule of 100,000 units annually has been reached and further gains are predicted. Increased production is credited to better labor control and more output per worker.

OUTLOOK: Manpower, occasional material shortages and design changes are causing less trouble, will become even less disrupting during the winter. Munitions production this year will be more than 50 per cent over that for 1942. Next year's war work volume depends on European struggle, with the well-informed predicting a cut of 50 per cent when Hitler folds.

CIVILIAN OUTPUT: Since end of European war would slash armament requirements, WPB is talking a strong civilian production program. Careful analysis indicates more talk than production....But 2,000,000 electric irons, 900,000 washing machines and 900,000 refrigerators are definitely planned for next year....And, essential civilian industries may soon be made eligible for manpower priorities under the controlled referral plan.

MATERIALS: Terrific expansion of output, and success of CMP, have broken almost every bottleneck in metals. Autos, number one peacetime consumer of steel, will not get metal soon....but sharply increased quantities of steel and aluminum will go to small civilian necessities before spring.

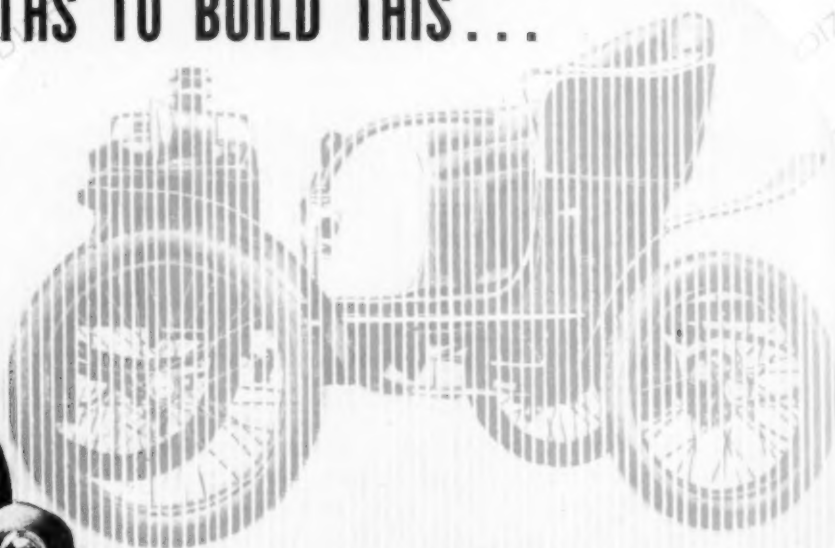
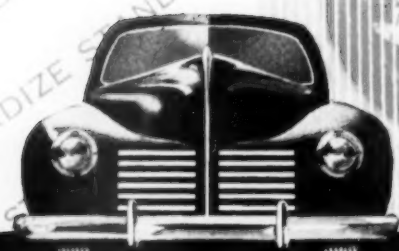
ALUMINUM: Relaxation of controls indicates trend in the metals outlook. Since civilian conversion is dependent on manpower, facilities, and materials, output every 3 months of 100,000,000 pounds more aluminum than war requirements is an indicator. Numerous additional uses have been approved.

CUT-BACKS: Indications are multiplying that mass production is working itself out of war work....First big cuts have come in Ordnance, 8,000 laid off in Salt Lake City, 5,000 in Milwaukee, and 5,700 in Lowell, Massachusetts....Ordnance Chief General Campbell says Army has enough ammunition "for any crisis", and WPB's Wilson suggests further cancellations soon.

MACHINE TOOLS: Volume of shipments continues to fall and size of the order backlog is reaching the "dangerous" point for the industry. Machine tool re-building and further conversion to direct war production is in the offing (See Page 110)....Big auto builders are looking into "Victory Day" delivery of machines. Size of prospective orders is small but encouraging.

LAST-MINUTE NEWS REVIEW OF MASS MANUFACTURING

IT TOOK 10 MONTHS TO BUILD THIS...



in 1 minute they roll out 4 of these

WHAT'S THE BIGGEST REASON FOR THE DIFFERENCE?

The Duryea Brothers' first "horseless carriage" was a triumph of individual ingenuity, but their original manufacturing methods would never have put America on wheels. Nor would they have enabled us to produce the volume of planes, tanks, and guns that are winning the war today.

Why is it that in 1941 one of the "big 3" automobile manufacturers could roll out 4000 cars a day, or one every 15 seconds . . . as compared to the months it took the Duryeas to build their car?

The answer in a word is: **STANDARDIZATION.**

The increased standardization of the last 30 years is the force that has brought hundreds of products of American industry to their present widespread use, and lowered costs.

A still greater standardization can bring many products to a still broader use, by an increasing number of people, in the years ahead.

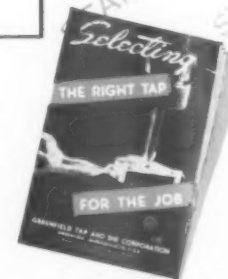


Standard Threads-
SAVE TIME - SAVE MONEY!

Full utilization of existing accepted sizes, pitches and forms can bring lowered costs to all manufactured products because: (1) it speeds production; (2) it reduces inventory. NOW, when plans for new and better products are taking shape—now is the time for a united effort to bring about greater standardization of threaded parts

Send for booklet "Selecting the Right Tap for the Job"—18 pages of Facts, Tables, Suggestions

GREENFIELD TAP AND DIE CORPORATION



GREENFIELD MASSACHUSETTS
THE TOOL ENGINEER



U.S. Army Signal Corps photo

O.W.I. photo by Dixon



National Defense Advisory Committee photo

Wright Aeronautical photo



INDUSTRIAL PLANNING

Production miracles don't "just happen". Behind the smooth-flowing assembly lines of mass-manufacturing stand countless hours of hard work and intelligent planning. Here is a "backstage" story on that planning

TIME is priceless in modern war. In military preparedness or in actual war in the field, time is the essence of victory. It applies with equal severity to the drafting board, the laboratory, and the production lines which provision the armies with the implements of war.

Sound production planning is the keystone of a successful time-saving manufacturing program. Intelligently conceived and persistently carried out, it coordinates the complex and divergent tributaries of mass manufacture into a smooth-flowing, continuous river of production.

In transforming from peacetime projects to war production, a company goes through a sequence of transitional stages.

Before the company bids on a specific war goods contract, the management must determine whether it can produce the article satisfactorily and whether additional plant capacity will be needed.

When a provisional contract is obtained, the company studies samples and blueprints to determine quality needed and delivery dates. Engineers

W. A. DAWSON

CHIEF INSPECTOR
ORDNANCE DIVISION
OTIS-FENSOM ELEVATOR CO., LTD.

break the job down, decide the best method to make each piece, estimate floor space required, and determine kinds and number of machines, tools, and other equipment needed, using existing facilities when possible. Designers then draw plans for tools, jigs and fixtures, and die makers start making actual tools.

At this point the purchasing agent gets prices on machinery, tools, and

materials. Master mechanics are consulted about subcontracting and accountants study cost.

After the company and the government sign the final contract, management orders new machines and equipment and acquires or constructs new plant capacity. Next the tool proving program is begun and production engineers set up a pilot line to produce the first few articles for testing. The company puts a nucleus crew of supervisors and mechanics through special training courses to acquaint them with production processes.

Next, subcontractors start producing, materials flow into the main plant, and the pilot line goes into operation. When the first finished article is off the line, government inspectors put it through rigorous service tests before giving the final green light that starts mass production. When this approval comes through, the company tests, hires, trains, and puts to work enough workers to run at capacity.

During all of these stages, of course, changes are being made in design, size of order, and delivery dates, and new

● In reconverting to new war jobs, or to civilian output, production leaders must have fingertip command of industrial planning fundamentals.

This article was voted AA-1 priority for current attention when presented to the American Society of Tool Engineers of Hamilton, Ontario. Convinced of its importance, more than average space is devoted to it here. Read it now and file for reference.



Ford Motor photo

While the Willow Run bomber plant was being erected, Ford engineers were adapting "custom-tailored" plans to mass production methods.

The drafting room is the cradle of planned production. Here the industrial planning department works out all of the complex and detailed machinery, processes, and procedures for coordinating innumerable components into a smooth-flowing unit. Planning engineers must have wide industrial experience

and better ways of doing the job are being devised and adopted.

Functions of the planning engineer are complex and ramified. They extend from the most obscure corner of the plant to the president's office.

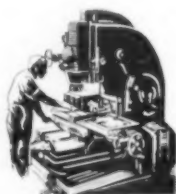
Sales orders must be scrutinized carefully to see if the type of work to be done is within the range of machine tools on hand and can be handled by the class of trained help available. Also, they must be checked to insure that adequate data is included for prompt manufacturing. The orders should specify such factors as quality of workmanship required, degree of machine finish, inspection tests and requirements, type of material and its brinell hardness, and shipping instructions.

Since the average manufacturer spends more money on materials than he does on machinery and labor combined, purchasing is an extremely important function of the planning department and entails careful study and scientific analysis. The requisition should specify metallurgical, physical, and dimensional properties, all of which should comply with general commercial practice. It should be a complete, systematically-written description of the material to be purchased, sufficiently accurate and definite to insure procurement, at the

lowest cost, of the quality needed.

During the present war, planners have encountered many new problems, two of which have resulted in innovations in specification measurements. Contracts from England have been accompanied by specifications given in metric units. This places a heavy demand on the purchasing agent to procure metric taps, chasers, dies, and thread gages graduated in meters. Accordingly, a metric system of dimensional properties has been adopted.

Also, material specifications stated on British drawings were partly foreign to American Standard material specifications used in peace-time.



● In dealing with war contracts, industrial planners have encountered many new problems. Two achievements they have brought about are adoption of a metric system of dimensional properties, and use of physical properties of steel instead of chemical analysis in setting up material specifications.

Steel specifications were based on physical properties instead of the chemical analysis basis commonly used in America. This has led to adoption of the yield value as a standard by the Inspection Board because performance is designed on yield strength of the material from which the article is made.

There are three principal requirements of a material specification. Under the heading of basic consideration come ability of the material to meet service requirements, ease of working in the manufacturing process, uniformity, availability, and first cost.

Exactness is another factor. All requirements of a specification should be made definite and exact by using numerical expressions of value. They then are verifiable by measurement or comparison and leave little chance for misunderstanding.

Standards is the third requirement of a good material specification. Consumer specifications should be formulated on the basis of the foundation laid down by technical societies or by governmental agencies.

Much greater advantage obtains, of course, from using specifications recognized as standard throughout the country than from using those standard only within the plant of a particular producer. National standards are evolved through collective work by leading experts on the subject and are in better standing than those of a particular individual. Furthermore, highest possible quality, a more uniform product, minimum cost, and maximum availability result from concentrating on one standard material of a kind.

Specification Should List Tolerances

Other general factors to be considered in a material specification are the vendor's reasonableness, fairness, and impartiality of interest in the material specification; inclusion of tolerance limits compatible with good performance of the product; and, if possible, a certificate of guarantee from the vendor that the material has been tested and meets all requirements of the specification.

Specific contents of a material specification should cover the following important points:

(a) **Scope:** General description of the material desired with reference to the equivalent national standards.

(b) **Applicable requirements:** Reference should be made to any suitable specification, general requirement, or drawings forming a part of the specification.

(c) **Manufacture:** This section should cover manufacturing methods and quality, processes, heat-treatment, welding characteristics, workmanship, and similar qualifications.

(d) **Chemical requirements:** A complete chemical analysis with allowable tolerances should be stated on the order.

(e) **Physical requirements:** General physical tests with tolerances should be specified, e.g.—tensile strength, yield, reduction of area, elongation, impact and hardness.

(f) **Form and size:** This important section should specify clearly length, weight, coil diameter, bars to be machine-straightened, and so forth.

(g) **Size tolerance:** Allowable variations should be selected from mill tolerances and specified.

(h) **Marking:** This section should describe the manner in which the material is to be marked and also the marking to appear on the shipping container. Since color marking is general in the trade, mills and warehouses usually are willing to comply with customers' wishes in this respect.

(i) **Rejection:** This section generally consists of a statement that any material not complying with regulations and limitations as presented will not be accepted.

Planning Department Charts Production

The planning department also is charged with responsibility for the sequence of operations necessary to keep production going. This function requires that the planner shall have a broad general technical and practical experience.

He must know the machining characteristics of the material to be processed. It is a well-known fact that steel which is high in alloys, such as nickel and chromium, has a low rate of machinability, or a high machine time index. The planning engineer must be familiar with the machine time index of various steels and with the comparable machinable rates of different metals, depending on their degree of hardness.

It also is important that the planner have information on the types of machines available in the trade to



Work leader instructs three newly-hired employees in the use of wiring jigs at a large West Coast aircraft plant.

Employee training is an important phase of preparatory operations for the production of a new item. A well-conceived employee training program pays off in higher production, reduced breakage of tools and equipment, less waste of material, lower labor turnover, fewer rejects, and lower cost per item

perform the desired operations economically. In the last ten years, principles governing design and utilization of production equipment have undergone an amazing evolution, leading to important changes in machine shop management and job routing. These developments have effected profound improvements in quality and productivity and in lower costs.

Machine tools can be grouped in three broad categories—universal or general purpose machines, unit type equipment, and special equipment.

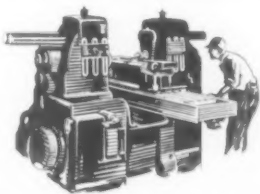
The universal type, generally used in tool rooms and in job lot manufacturing, is common to every metal cutting establishment. With modern de-

sign, this type accounts for much of the production of articles which are not turned out in quantities that will justify an investment of mass production machinery.

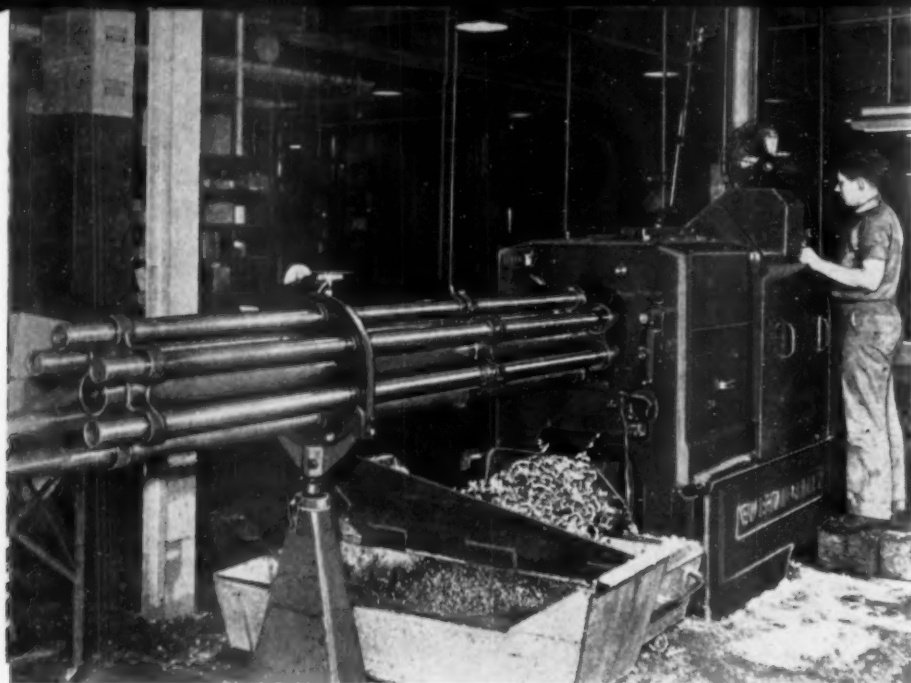
Unit type equipment is widely used in the automotive industry. The outstanding characteristic of this type is its extreme flexibility. In general, machinery in this classification is designed with an assembly of component units, such as a standard base, a column, a table and any number of independently-mounted and individually driven heads. The important point to note is that in the process of changeover, only certain replaceable elements of the machine must be changed, so that a major portion of the initial investment can be salvaged. Usually, only about 25% of the original cost of the machine is thus affected.

Flexible Machines Aid Design Changes

The degree of flexibility of this machine has effected a profound change in mass production industries. Another important advantage of this flexibility is that it expedites progressiveness in product design, since the designers no longer fear product changes, even during the course of a given model run.



● The machine tool industry has made remarkable progress in design and utilization of production equipment during the last decade. Industrial planning calls for knowledge of these improvements and their adoption to effect increased production, greater efficiency, and lower operating costs.



O.W.I. photo

After conversion from peacetime use by means of simple changes, this New Britain-Gridley machine is turning out 20-mm. shells.

In war production, many operations foreign to peacetime manufacture are necessary. By converting existing machines to the job with special machines, fixtures, and work-holding devices, planning engineers achieve sizeable savings in capital outlay and also eliminate delays in delivery of hard-to-get equipment

Special, or single purpose, machinery has an economic place in industry, even though it has the drawback of comparative inflexibility, which makes product changes difficult or impossible. Latest developments, however, indicate that much of the early inflexibility of this type of machine may be overcome by methods employed in unit type machine design.

Perhaps one of the most significant accomplishments of machine tool designers has been the development of unit type machinery of high flexibility which lends itself to job-lot production. The latest practice is to select a family of similar parts or similar kinds of operations on different parts and to route them over the same machine.

One of the best examples of this procedure is found in the case of surface broaching machines. Broach builders have designed the so-called utility broach of single-ram type, which lends itself to a wide variety of operations when simple and suitable changes are made in broaching tools and work-holding fixtures. The same principles are applied in utilizing drilling machines when it is possible to use a basic heavy-duty single column drill press fitted with a large variety of interchangeable multi-spindle heads for drilling, tapping, and similar op-

erations. Precision boring machines and many other types of equipment also may be made to do double duty in this way.

The industrial planning engineer must be familiar with the available products of the machine tool industry and must acquire the judgment necessary for proper selection of the machines particularly suited for the job at hand. Judgment values include such considerations as desired productivity, anticipated product changes, nature of the process, funds available, and amortization practice.

Another capacity which the planning engineer must possess is a gen-



● With so many varied operations necessary in mass production, planning departments must be conversant with the products of the machine tool industry. Also, they must exercise considerable judgment and skill in buying, to avoid excessive expenditures for machinery which has limitations in adaptability to various operations.

eral knowledge of tool design. The most important part of a machine tool, in at least 75% of the cases, is the fixture, since the workpiece can be machined only as accurately as the fixture is built. Salient points to consider in fixture design are:

1. Location of part
2. Ample clearance to load and unload part
3. Adequate chip removal
4. Rigidity of fixture to withstand abuse
5. Clamping of parts to eliminate distortion of finished part and of fixture
6. Design that permits use of standard commercial tools and that facilitates changing of tools and perishable parts
7. Use of good grade alloy steel, heat treated and ground, for perishable parts
8. Rest plates designed to clear their surfaces of chips
9. Provisions for coolant to flow freely on tools
10. Use of straight locating pins with bullet nose, instead of tapered pins which will not clean themselves and which are easily thrown off location by dirt and chips
11. Use of single purpose fixtures whenever possible, rather than rotary, trunnion or conveyer type

Planners Must Know Metal Specifications

An appreciation of proper cutting speeds and feeds for various materials of known heat treatment when processed on different types of machines also is part of the planner's qualifications.

In general, it is found that hss. tools have increased the speed by 100%, carbide tools by 300 to 500%, with feed increased to take care of tooth load. No rigid feed or speed can be set because the material, machine, tools, and the job itself must be considered and then the speed set accordingly, based on the known surface ft. per min., tool dia., and tooth load.

Machine loading control has two objectives—to keep machines in continuous operation and to assign dates for processing each unit of an order so that the shortest possible production time results. It is therefore essential for the planning department to know how long work in hand will occupy machines, and, as each new order comes in, how much time any particular machine will require for each operation to be performed on it.

In considering machine loading, two controlling conditions are found—those where capacity can be measured in terms of product output such as

pounds, numbers, yards or some other unit per hour, and those where it can be expressed only in hours of work. In the second case, which includes most machine tools not specialized for particular work, operation study must be made to determine a time allowance for the part to be processed.

Some method must be arranged to keep an account of machine loading and to provide for finding free dates as new orders come in. This may be either in ledger or graph form, although the graphic method appears to be more flexible if well designed.

In scheduling machine loading, it is customary to space successive operations so that one day or more lies between them. This forms a cushion of work which can absorb slight delays without disturbing schedules.

A knowledge of new processes also has an important place in industrial planning. For example, the development of a new machining process, such as surface broaching, is an important consideration in buying machinery and setting up production schedules. Another recent development is the manufacture of precision gears by mass production using a gear shaving process which requires no further finishing.

Examples of other technical advances affecting planning are coining to shape from billets, new die casting procedures, increased use of special hard cutting tools for high quality surface finish, induction hardening, production thread grinding, X-ray inspection, centrifugal casting, hard chrome plating, and powder metallurgy.

Production Time-table Controls Assembly

Scheduling, or fitting specific jobs into a general time table so that orders may be manufactured in accordance with contracts or so that each component in mass manufacturing may arrive at assemblies in due order and on time, falls in the province of the planning department.

Principal conditions to be met by scheduling and progress control can be classified as follows:

(1) Manufacturing to order, i.e., where orders go through shops to individual parts. Assembly is dependent on all parts being ready simultaneously. (2) Stock manufacturing, in which parts are made in large quantities and put into stock. Assembly is independent. (3) Continuous manufacturing,



Ford Motor photo
Aluminum rivets are made corrosion resistant at the Willow Run bomber plant by putting them through the "Alrocking" process.

Sound production management calls for adoption of new and improved processes whenever possible. Production engineers are always on the alert for new methods that will cut time and costs; they do not hesitate to make changes, even though doing so may involve scrapping considerable obsolete equipment

in which a single part goes through a series of processes without assembly.

(4) Mass production. Parts are made continuously, and sub-assemblies and assemblies increase or decrease with the output of parts.

Scheduling for classes (1) and (2) consists of three steps — scheduling within the order, scheduling of the order in relation to other orders, and scheduling to machines. When all processes on all parts or lots have been assigned to machines, scheduling is complete.

After scheduling has been set up, progress control is established to insure that the program actually will go

into effect, and dates are set for each operation observed. Progress is controlled by route sheets, Gantt charts, control boards, or by combinations of these mechanisms.

As soon as the product has been analyzed into parts and processes, master schedules should be set up. Relative dates on the master schedule are then converted into actual dates by application of a calendar scale.

Operation studies on orders should then be undertaken in rotation as indicated by the shop program schedule. As each is completed, the preliminary master schedule is corrected for operation time, so that machine loading may be carried out on an accurate basis.

The order now has been incorporated into the stream of production. If assignments to machines are carried out as planned, the various parts will be delivered at assembly points and join at final assembly in time to meet the promised delivery date. To insure this, a control mechanism must be set up.

Progress control may be through route sheets, but the more common practice is to use Gantt charts, especially in continuous manufacture.

For ordinary machine shop work, attention should be concentrated chiefly on getting parts through one process in the allotted time so that



● Machine loading control is undeniably an important segment of planned production. With a well-executed schedule, it is possible for machines to be kept in continuous production. Dates for processing the individual parts may be determined with accuracy with machine load charts.



Chevrolet photo

At Chevrolet Division of General Motors, wall charts serve to maintain an up-to-the-minute check on production.

Progress control through a master time-table is an essential part of a successful industrial planning program. By means of charts, an accurate record may be kept of each step in the manufacturing process so that all components will arrive in final assembly at the proper time and in the right order

they will be ready for the next operation on schedule. A master schedule is representative of this type of production program.

Objectives aimed at in progress control are the same, regardless of what form of mechanism is adopted, namely: that attention shall be focused on approaching jobs in time to release orders and take other steps to get them into production, and that actual performance shall be recorded, preferably daily, and checked with planned performance as to due dates and quantity processed.

Routing Concentrates Production Equipment

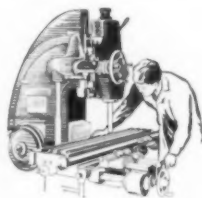
Industrial planning also carries with it the responsibility of issuing orders which, if followed, will provide materials, tools, and equipment at the time and place needed for production. This is termed routing and dispatching.

Route sheets deal with specific manufacturing orders. One sheet is required for each part or component of the order. On such a sheet is assembled working data for controlling the progress of the particular piece through the shop. A spoilage allowance always is required.

Route sheets are used to check on

subsequent steps of control and shop procedure and to register progress of the part from start to completion and delivery to stores or assembly.

The manufacturing order is first broken down into parts and assemblies and route sheets are made out for each. These sheets indicate material to be used and the operation to be performed, together with their sequence in the manufacturing process. Against each operation is entered the time allowance, date of beginning and completion, and tools and fixtures required. A corresponding blueprint gives data for inspection limits and



● Idle machine time is wasted time. In a well-organized plant, an "idle machine report" is made out whenever a machine is shut down for lack of material. This is turned over to the planning department which makes a careful study of the cause and takes steps to remedy the trouble.

tolerances allowable on the job.

To give effect to this information, material, tool, job, inspection, and move orders are made out as soon as dates assigned for the operation are established. Working papers then are filed until a day or two before the job is put into production. They then are issued, released, or distributed by a dispatcher to the persons concerned with the operation. Material is delivered at the machine, tools and fixtures made ready, the operation performed on the material, pieces inspected, and those passed moved on to the next operation.

Dispatching may be defined as routing or setting productive activities in motion, through release of orders and instructions, and in accordance with previously planned times and sequences embodied in route sheets and loading schedules.

Principal factors included in dispatching are:

- (1) Moving of material from stores to first process
- (2) Issuing of tool orders for collecting and making ready tools, jigs, and fixtures in advance of the time needed
- (3) Issuing of job orders in accordance with dates and times previously planned
- (4) Issuing of inspection orders after each operation
- (5) Recording time of beginning and completion of job
- (6) Recording and reporting idle time of machine and operator

Work Papers Filed For Each Operation

Filing working papers is an important problem in dispatching. There are two main variants—where route sheets are kept in dispatching cages, and where they are kept in a central planning office. Orders pertaining to parts can be filed either according to machines or by order numbers.

The central feature of a dispatching office is a dispatching board which provides a space for the job actually on the machine, for the next job in sequence, and for several jobs ahead. With such a setup, shortage of work for any machine is detected and reported to the planning department.

A good method to initiate movement of materials is to duplicate the stores issue order and to attach it to other working papers which are handed to the dispatcher for release at the time work is to start on the part.

It also is recommended practice to specify cutting tools for the job, as

well as to list all jigs, fixtures, gages, and other equipment that will be required. These are listed on a tool order.

With materials and tools provided for, authority to proceed is given by release of a job order. On release, the order is time stamped and handed to the operator who collects his tools and goes to the job. When the work is completed, he has the order time-stamped and a new one is given him.

The original and a duplicate of the completed job are then forwarded to the planning department and to the cost and payroll office for entry in their records.

Inspection also must be provided for, and the completed work must be moved to the next operation. Instruction forms for these two functions frequently are combined. These orders are time-stamped and returned to the dispatcher, who sends them to the planning department for entry on route sheets and control boards.

Whenever a machine lacks work, an "idle machine" report is made out. The planning department should then carefully study the cause of idleness and work out plans for eliminating it.

THE END



Chrysler Corporation photo
Tanks rolling off the assembly lines at the Chrysler Tank Arsenal symbolize the end-product of industrial planning.

Uninterrupted movement of the final assembly line is proof that the planning engineers have done a good job. All materials, manufactured parts, and sub-assemblies flow in scheduled order into the line at the pre-determined time and place to form an integrated continuous river of production. It is this marvelous coordination of the innumerable components of mass manufacturing that has made American industry a powerful force for certain victory

AUTOMATIC INDEXER FOR GEAR TOOTH GRINDING

Where the depth of cut desired in gear tooth grinding is greater than can be taken with a single adjustment of the cutting feed, an

automatic adjustment has been developed which automatically advances the feed after each complete cycle of the gear. The idea was de-

veloped by engineers of the Lycoming Division of the Aviation Corporation.

A ratchet is mounted on the worm gear feed control of a standard gear grinder. A dog on the end of an eccentrically mounted push rod actuates the ratchet, when a micro-limit switch is tripped by a pin on the index plate. The switch operates a solenoid, which engages the clutch between the eccentrically mounted push rod and a continuously operating one-sixth horsepower motor.

A sleeve-and-thread adjustment on the push rod permits setting it with sufficient accuracy to advance the cutting feed in the degree desired.

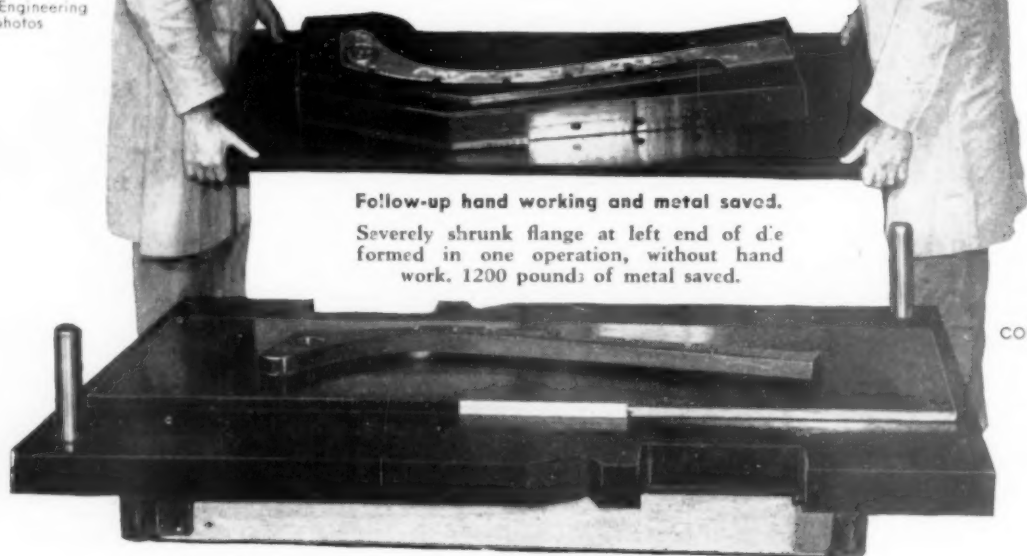
Manual advancement of the cutting feed is eliminated by this automatic arrangement, which makes it possible for one operator to keep three gear grinders in operation.

AVCO photo



Plastic Dies and Die-Sets

Cook Engineering
photos

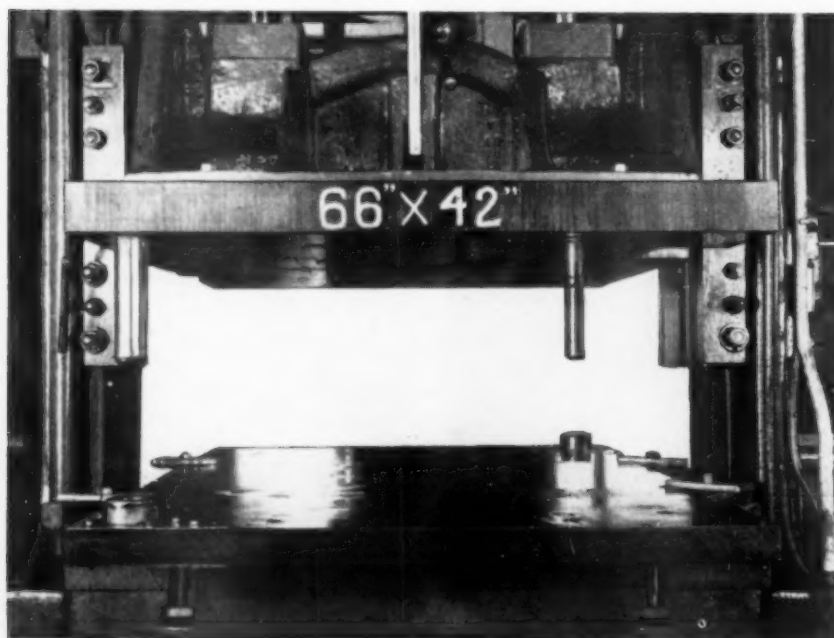


Follow-up hand working and metal saved.
Severely shrunk flange at left end of die
formed in one operation, without hand
work. 1200 pounds of metal saved.

**DAVID
COOK**
PRESIDENT
COOK ENGINEERING
COMPANY

A pioneer authority in forming, blanking and perforating with lightweight plastic dies points to present and post-war advantages. An immediate benefit is the broadened applicability of mechanical presses to relieve a bottleneck

Plastic dies may be four times lighter than steel dies of equivalent strength. Die-set shown weighs 690 pounds. Upper shoe is 3" thick, lower is 2", and corresponds in strength to 1 1/8" steel, weighing more than a ton.



ALL-PLASTIC DIES and die-sets — simple, yet revolutionary in their applications — are among the latest developments in America's battle to "beat the shortages" in metal and manpower.

Marked success has been achieved in dies for piercing, blanking and forming soft steel and aluminum alloys. Light weight, easy handling, low cost and time saving, indicate that what was at first an emergency measure may find many uses in post-war fabrication.

These new dies make it possible for any firm with a mechanical press to manufacture formed parts for assembly. Since hydro-presses have been so over-loaded, the broadened applicability of the many available mechanical presses relieves a critical bottleneck in aircraft production. Forming and assembly in the same plant at great savings in handling time and costs is another immediate benefit.

PLASTIC ONE-THIRD METAL WEIGHT

Probably the outstanding feature of plastic dies and die-sets is their lightness and the ease with which they can be handled. Complete with steel bolts, springs and dowel pins, the new dies are, on the average, about one-third as heavy as comparable sized metal

dies of equal strength and stiffness (specific gravity of plastics used is approximately 1.34 compared to specific gravity of steel at about 7).

Two men can handle a 3" plastic die-set top plate without the use of stack or crane. In addition to reducing equipment costs by eliminating crane handling and inner plant truckings, materials handling is tremendously speeded and safety engineers point out that industrial accidents are measurably reduced. With women making up such a large part of the working force today, increased emphasis is placed on light weight, easy-to-handle equipment.

PLASTIC DIES FORMED FASTER

Another advantage of plastic dies and die-sets is that they may be produced in less time than is required to fabricate regular steel dies. When an entire production line may be held up because of broken dies, shortening replacement time from weeks or even months to a few days is of major importance.

Cabinet makers and wood pattern makers, most of whom might not otherwise be able to use their skills in war work, can produce plastic dies and die-sets just as fast as regular tool-makers and die-sinkers, so there is not only greater speed in production but an availability of working power. Actually, since this is a forming process and not a molding process, much plastic die work can be handled by unskilled labor as the materials are easy to work.

Obviously, there is a major saving in critical materials inasmuch as the dies require steel only in the bolts, dowels and springs. Expensive scrap is greatly reduced because errors generally demand alteration of only a small section of a laminated die.

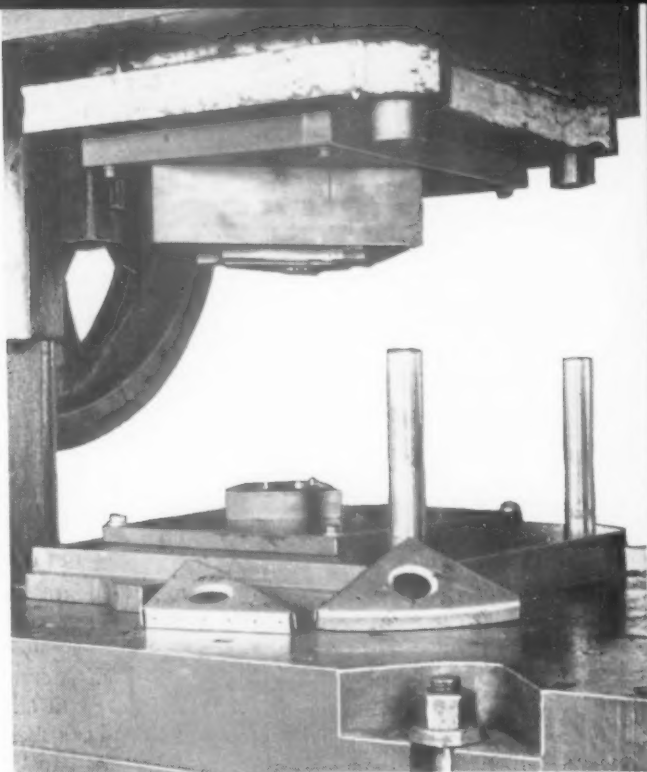
WILL NOT DAMAGE METAL SURFACE

Since it has a resilient surface, the plastic die will not scratch or damage coated metal surfaces. Often ordinary forming processes with steel dies will coin an Alclad surface dangerously, thinning the delicate protective coating enough to allow corrosion or necessitate a re-application of protective finish. Plastic dies will actually spring away from the metal rather than mar it.

Although plastic dies were born of wartime needs there are several advantages which give them much peacetime promise. Ease of revision is of

Parts formed entirely without hand work.

In hydro-press work, it would be necessary to machine some of the shrink flanges shown here, but not with plastic dies used on mechanical presses.



interest to all industry, but particularly in the aircraft field. The relatively small runs of aircraft parts and rapid design changes require frequent die revisions. It has been proved that two sets of plastic dies can be made quicker, easier and at virtually the same cost as one steel die. On a short run, where half the utility of an expensive steel die might be thrown into the scrap heap, minor changes permit continued use of a plastic die. Or if scrapping of a plastic die is necessary, the cost is only half that of steel.

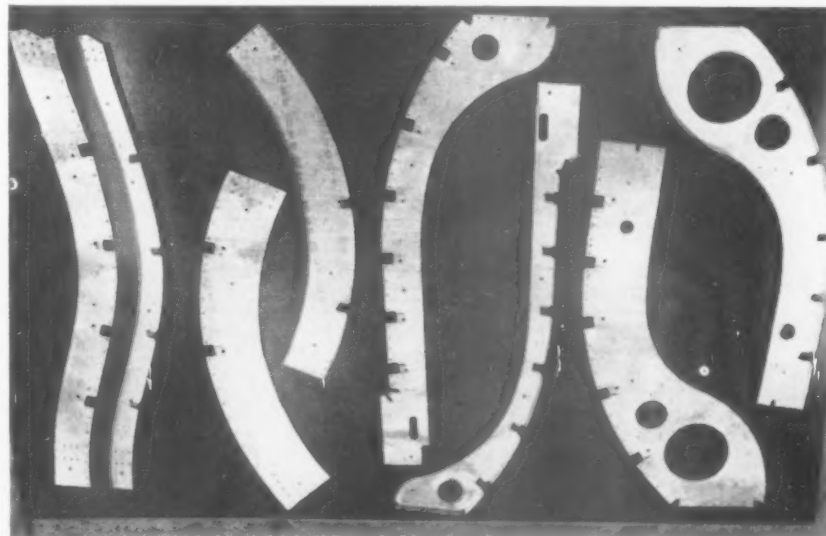
The plastic die-set is no more expensive to make complete with locating leader pins and drill bushings than

it is to coordinate a set of backing plates where multiple sets of dies are being used in one die-set. Thus 250 to 300 dies might be designed to fit into as few as half a dozen die-sets. The advantages of having an entire die can be maintained, while the fabrication is facilitated by the decreased weight. There is a further saving in eliminating several expensive machine operations — principally planing and grinding.

In fabricating a plastic die, a low cost, high strength lignin plastic (such as Masonite die stock) is used for backing plates, die blocks and most strippers. The innovation that makes

Parts struck without wrinkles or scratches.

Die and small die-set, built from plastic, leave no scratches or coin marks.



these dies "all plastic" is the introduction of laminated phenolics for probably the first time in die making. This material is used for forming rails and punches, so that no metal is required, other than for screws, pins and springs. (Occasionally, very narrow strippers or mechanical parts are developed from steel.)

EASE OF CONSTRUCTION

In the production shop, work begins as usual with the layout department. Starting with the layout template or the form block template, the original layout is planned. In some cases templates are developed from engineering drawings or aircraft design drawings, or both.

The laminated plastic is rough-cut to pattern and forwarded to sub-assembly. Here laminated phenolic punches enter the line; die blocks are set up and the rails fitted to the punch. Final step here is bonding all laminations in the die block into one unit.

Final assembly begins with preliminary fitting by index dowels. Top laminated rail supports are fitted to the die block and rails. Rails are installed in the die block. The completely assembled die block is fitted to the backing plate, and the full set of dowels and screws is inserted after the final lamination. An all-over protective coating seals the die stock and prevents oil saturation in use. This also increases dimensional stability and aids hardness.

Plastic dies are being produced with tolerance as close as plus or minus .003" and part tolerance of 1/32". They show surface hardness considerably greater than Kirksite; have, of course, a low co-efficient of expansion; are highly abrasive resistant, shock resistant, and have compressive strength beyond that of steel.

Such dies have proved particularly suited to "form and draw" die combinations. They require no second operation or hand working, even on

closed angle forming. This severe single operation forming is accomplished by the ingenious use of synthetic rubber and requires no mechanical cams.

LONG DIE LIFE

From an engineering standpoint the major problem is the proper laminating and supporting of the die stock to cover reduced shear and tensile strength. After exhaustive testing, the only limitations that can be seen for plastic dies are the limitations imposed by capacity of the existing mechanical presses. As for the length of run, the upper limit of plastic die life is not known. The maximum known service to which any of these dies have been put is 7000 parts, and even then close examination shows no wear. It is estimated that runs of at least 50,000 parts are feasible with plastic working surfaces forming soft steel or aluminum alloys.

THE END

TAPER BORING BAR

Numerous advantages inherent in shipbuilder's tool design

CREDIT for originating the boring bar design, shown in the drawing below, is deserved by Vic Lepky, an employee of the Bethlehem Steel Company's Shipbuilding Division, San Francisco.

Because of its highly satisfactory performance, it has been recommended to other war production plants by the WPB and recognized with a prize award by the War Production Drive.

The following seven advantages are provided:

1. **Four tapers**—The boring head, being cone-shaped, can be made to take four different tapers by cutting three additional slots or guides to the required taper from the centerline and fitting new heads, and using the same tool

head and feed screw by changing from one taper to another.

2. **Tool head feed**—The tool head has a feed screw which runs the complete length of the taper cone.

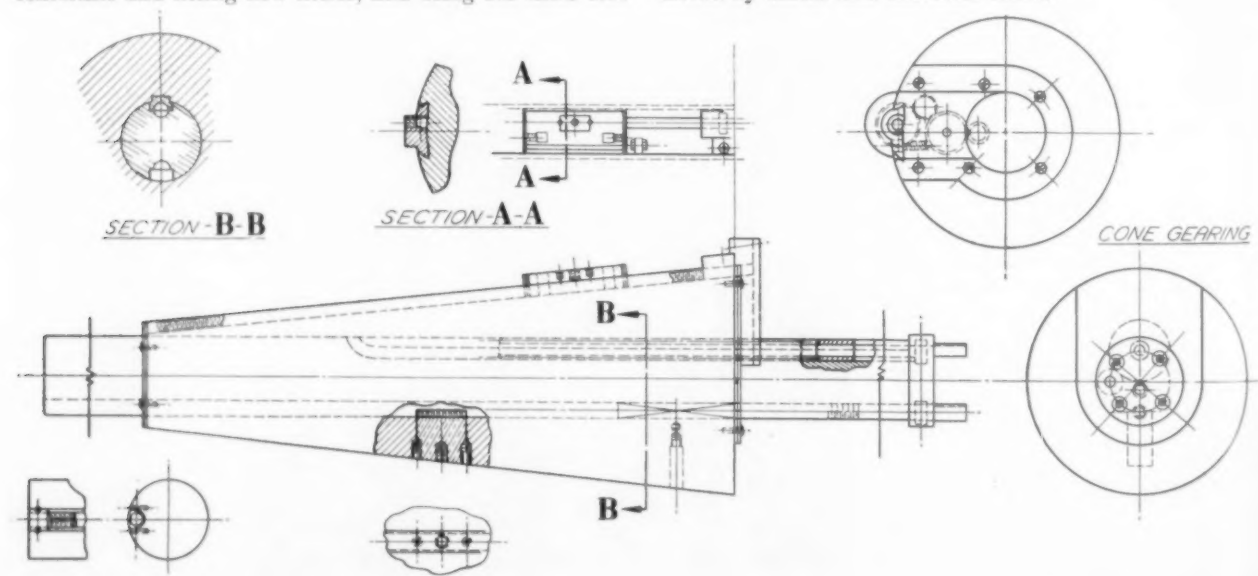
3. **Bar feed**—The bar has a feed screw which runs the complete length of the bar.

4. **Straight boring**—A straight hole can be bored by using the bar feed and locking tool head on the cone head.

5. **Tool feed**—The cutting tool can be fed in by using the feed screw on the bar.

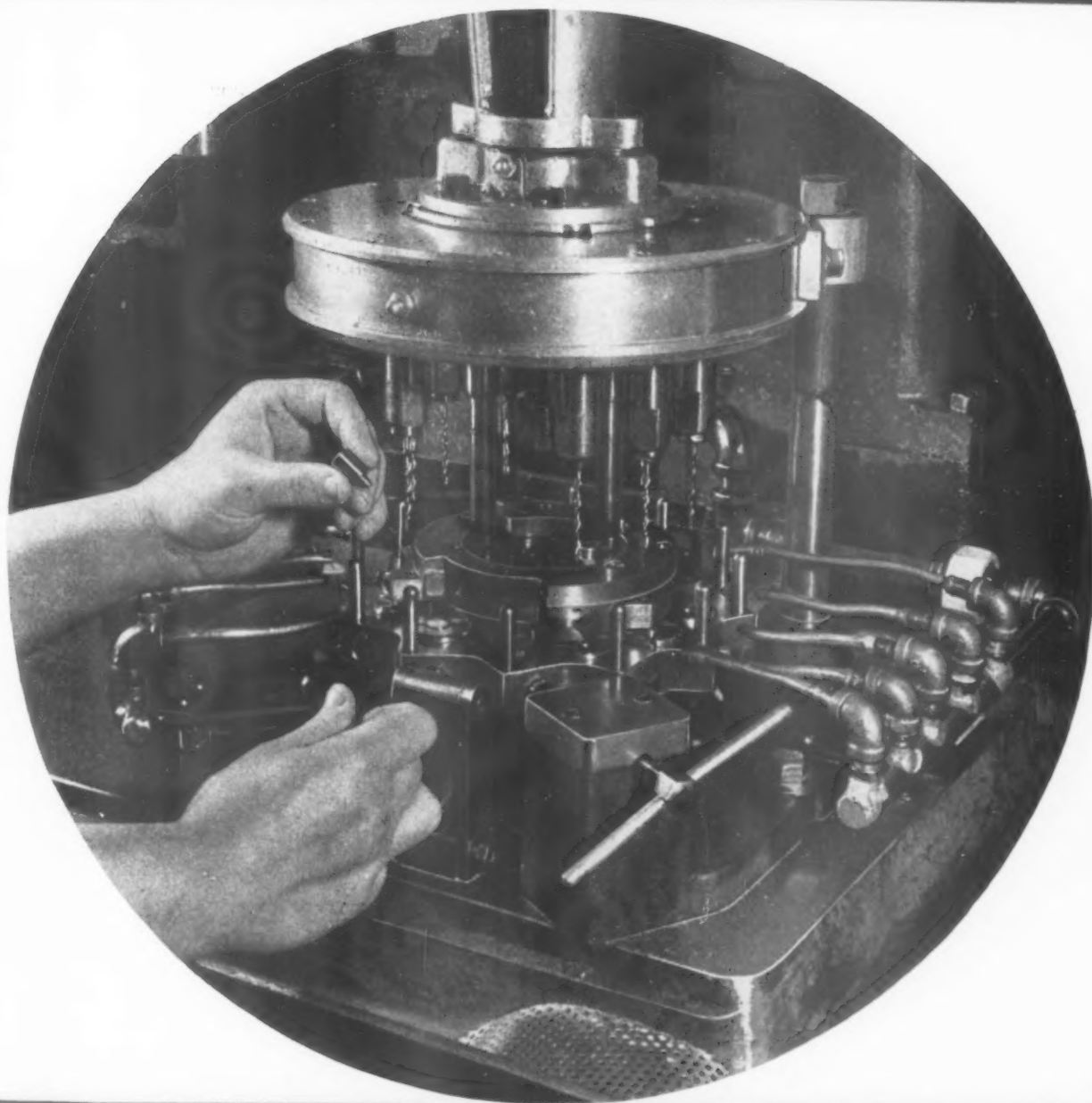
6. **Facing head**—The bar has an independent facing head for facing purposes.

7. **Bar drive**—The bar has a worm and worm-gear drive, driven by motor and universal shaft.



PRODUCTION

MACHINE AND TOOL ENGINEERING



Multiple heads and indexing fixtures are typical of high production tooling Fisher Body uses to save time and materials.

"HIGH PRODUCTION METHODS FOR PRECISION PARTS"

The Fisher Body Division of General Motors has proved itself a master at building a broad range of war products. Here are described design and manufacturing changes which have favored production, saved materials and improved the product

THE TOOL ENGINEER

Streamlined Production

High Production Methods for Precision Parts

SPECIAL FEATURE BY THE EDITORS

THE FISHER BODY DIVISION of General Motors would have to hire a sizeable hall to exhibit the tanks, guns, planes and accessories to these weapons which it is mass producing. But an exhibition of its achievements is the last thing to be expected of this important American manufacturer who converted automobile body "craftsmanship" to the application of line production methods in fields where precision and delicate assemblies—or sheer weight and tough materials, as with tanks—seemed to defy such application.

In its concentration of plants in Southern Michigan, and in scattered locations in the Middle West and South, comments of Fisher engineers concerning their company's achievements are continually tempered with credit to the products' designers and the pioneer work of earlier manufacturers of the same or similar products. Fisher progress, according to those responsible for it, is only one step in the overall progress toward building superior war products in superior numbers.



FISHER BODY'S CONTRIBUTION

NONETHELESS, to the production engineer now interested in getting the most output for a given input of manhours, materials and machine time, the step for which Fisher is responsible is highly important. And, just as the various units of this company have built upon the experience of others, they appreciate the value of disseminating information on their "know-how" which may prove applicable in war industries generally.

But before taking a cross-section view of manufacturing savings, certain unique factors in the background of this war production achievement are worth noting.

First, Fisher converted manpower and engineering talent from the comparatively broader tolerances of automobile body construction to an understanding and application of mass manufacture of precision-built war products.

Second, to speed its entry and maintain schedules, this unit of General Motors proceeded to build machine tools and cutting tools. With its own needs satisfied, it has continued to supply manufacturers with certain basic tools.

Third, Fisher production engineers considered methods of speeding production and saving materials, not only without sacrificing quality, but frequently with resulting suggestions for the improvement of product performance.



AUTOMOTIVE PRACTICE INTRODUCED

FOLLOWING PAGES are largely devoted to improvements effected by the Ternstedt Manufacturing Division of Fisher Body. In adapting high production equipment to the fabrication of delicately balanced aircraft instruments, their success has been notable. In suggesting slight design and manufacturing changes, which have favored production, saved materials or improved the product, they have earned a large measure of credit.

This division of Fisher activities is not alone in its accomplishments—no more than is Fisher alone. In fact, much of the preliminary effort toward obtaining a story of this type is in overcoming this company's reluctance to step into the spotlight.

Other Fisher activity is indicated in highlights of their progress in welding airplane parts and in several details of improved tooling which are described.

But before getting into the actual technical consideration, one possible misunderstanding might well be recognized. Certain automotive practices which this company perfected have been introduced in its war production effort. They did not come to the job empty-handed. For example, a shaper has been applied to trimming formed aircraft sections. Results are a cleaner job, trimming to precise dimensions, less scrap and a saving in time.

More numerous examples of the use of non-critical punch presses than can be described also show the use of traditional equipment and previously learned skill.



Streamlined Production

An 8-station fixture used to mill flats on gimbal ring.

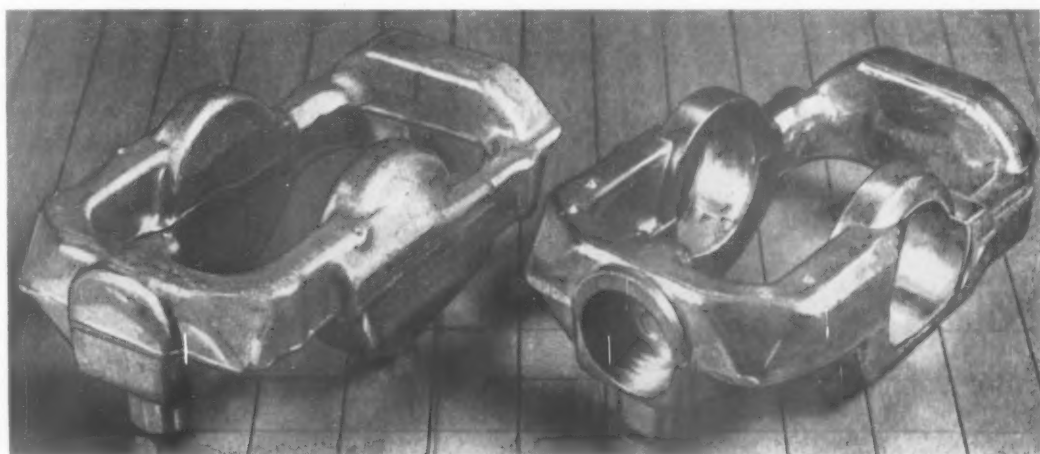
Die Casting Saves Materials and Machines

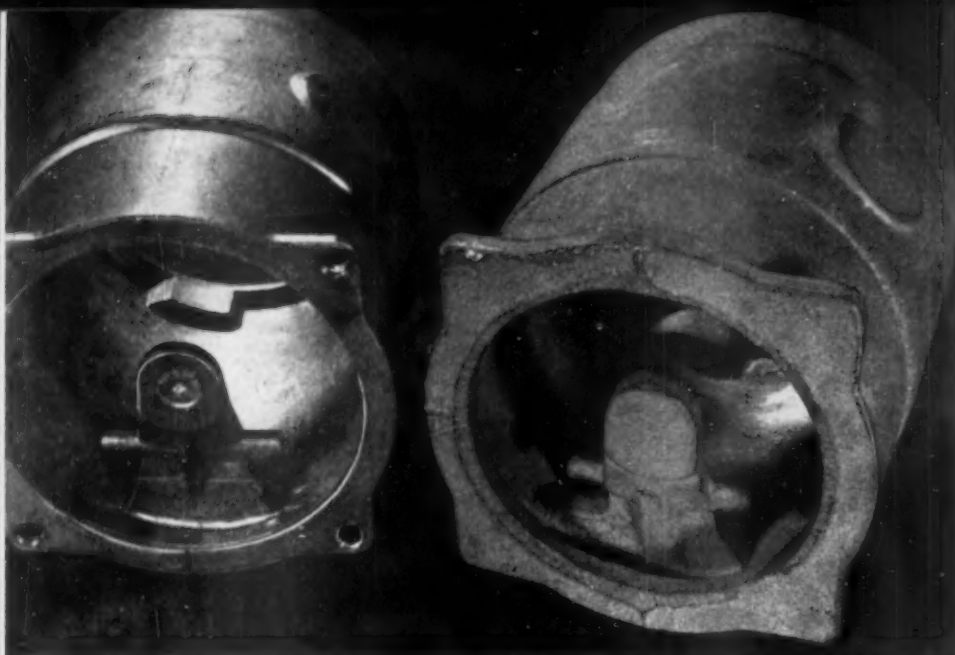
NUMEROUS SAVINGS as well as product improvements, have resulted from replacing such fabricating methods as sand casting, forging and stamping with die casting. In each instance, a saving in material—aluminum alloy in these examples—can be taken for granted, in that die casting produces a product more nearly dimensioned

to specified size than either forging or sand casting, and generally requires less stock than stamping. For the same reasons, less finish machining is usually required. However, overall factors of labor saving, unit cost in relation to the run, and the necessary "know how" on alloy control and operation control must be figured into every job.

The die cast gimbal ring at right requires less metal, saves machining. Old forging method is at left.

Fisher Body
Division photos





Die cast horizon gyro case at left replaced the sand casting pictured at right with obviously beneficial results. Die casting the pivot support arm required the development of collapsible core to permit removal of die from the part.



Both the directional gyro cases shown here are die castings. The one at the right, however, has been cast more closely to the finished design. Collapsible core permits casting bosses at each end, saving metal and a time consuming milling machine operation.

Ternstedt changed an aircraft instrument case fabrication from sand castings to die castings with savings in materials, labor and machine time. Internal design on both items was such that the parts did not lend themselves to conventional die casting die structure.

The cylindrical aluminum alloy case for the Gyro Horizon Indicator incorporates a pivot support, or integral bracket at one end stemming from the side of the case. In addition, there are internal flanges at each end. A collapsible core in four parts, which dovetail together, is set in the die casting machine. Following casting, the center supporting section of the core, to which the outer sections are keyed, is withdrawn and the sections adjacent to the part's walls collapse. An immediate saving in these basic operations—die casting over sand casting—is realized in the time and production materials conserved.

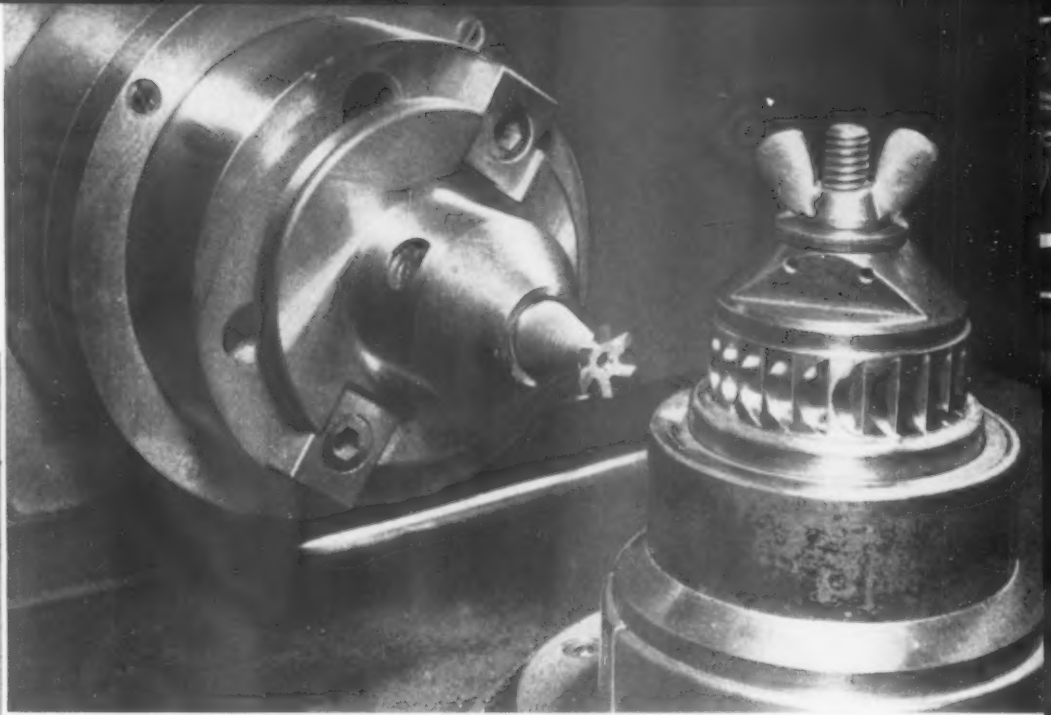
Streamlined Production

Further saving results from lowered machining time. Where the sand casting was machined all over, it is necessary only to bore grooves in the inner wall of the die casting, to face the ends, and to spot face and drill the pivot support.

On the square instrument case for the Directional Indicator an improved die casting resulted in material savings, machining savings, and through these measures, in manhours conservation. At both ends of this case, nine lugs or bosses are required in which holes are tapped for unit assembly. Originally, in die casting, the lugs were cast as ribs, running the full length of the inner wall. In finish machining, it was necessary to mill away excess metal, using a tool and technique similar to that required in keyway cutting. This operation resulted in cutting the skin of the part, and thus in comparison with the improved method, weakened the product. The new method employs a collapsible core, so that lugs are cast to final dimensions. Not only was a tedious machining job eliminated, but the skin metal—an important strength factor in die castings—was preserved intact.

Product Re-design Saves Brass

Close-up of the milling operation (safety guard removed) which saved several machining jobs and brass. Rotor buckets are cut in one pass. The work is indexed for each advance of cutter.



AN AIR-DRIVEN ROTOR on a directional gyro indicator was formerly produced at the expense of a number of machining operations, including stamping, three turning operations and spinning. It is now fabricated in a single basic production milling operation to which two other high production finishing jobs have been added.

Production time has been shortened, less scrap results from fabrication, and fewer products fail in inspection.

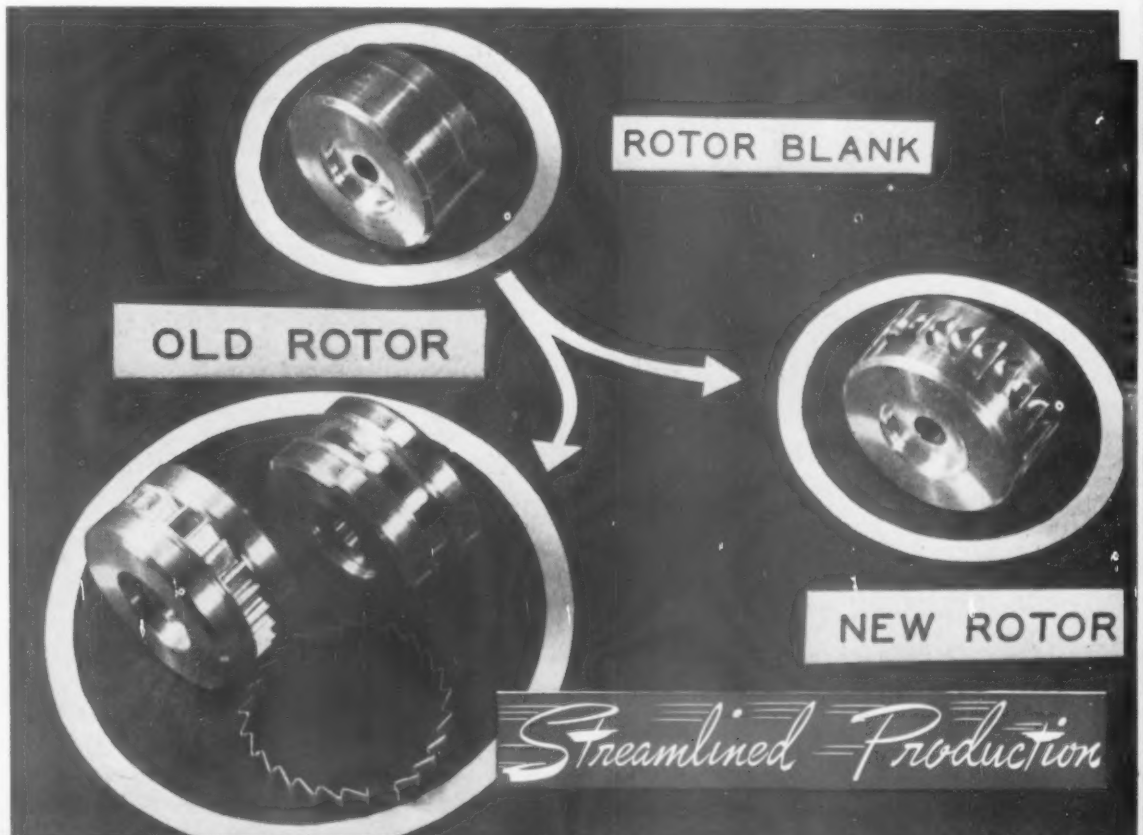
Originally, the rotor was produced in two parts. First, the body was turned down from brass bar stock into a spool, with small undercuts to provide flanges which were spun over a stamped corrugated strip that was wrapped around the grooved recess of the spool. The corrugated strip formed the blades of the rotor, and was designed so

that on assembly, one end locked with the other.

Scrap from fabrication included the chips from turning the bar down as well as the trim from blanking prior to stamping the corrugated strip. Scrap from product failure was caused by centrifugal force throwing the blade or bucket strip from position.

The improved method consists of milling the buckets in the solid bar on an indexing fixture. A form cutter mills approximately 20 buckets in two minutes. Slight burrs are removed by sand blasting. In that this operation produced a slight radius on the bucket edges, an overall grind of .002" is required to remove the radii, leaving sharp, clean edges. Because the part is produced in one piece there can be no failure because of assembly.

New method of fabricating from the same blank resulted in producing a new rotor superior to the old, and in much less time.



High Production Machining Methods

High production boring equipment has proven satisfactory in maintaining close tolerances on directional gyro gimbal ring. Two parts are bored simultaneously as shown. Safety guard is removed to illustrate this set-up.

PRODUCTION of an aluminum gimbal ring for a gyroscope by Ternstedt illustrates several features by which higher production for war time needs was obtained. Peacetime procedure had been to forge the part, with the normal amount of excess material remaining to be machined away.

Placed on a high production schedule, this part is now die cast. Core holes, cast to hold the pivot bearing housings, offer an obvious example of materials and machine time savings. Through these holes, locating plugs are fitted to position the part so that four bosses can be milled flat to furnish locating points for rough and finish machining. Two of the bosses are cast on the part solely for locating purposes, and are removed in a finishing operation. Several machining operations were required on the forged part before the part was in the degree of completion at which machining is begun on the die casting.

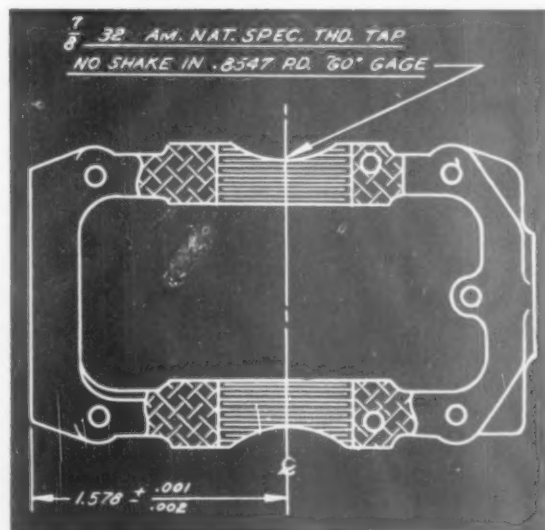
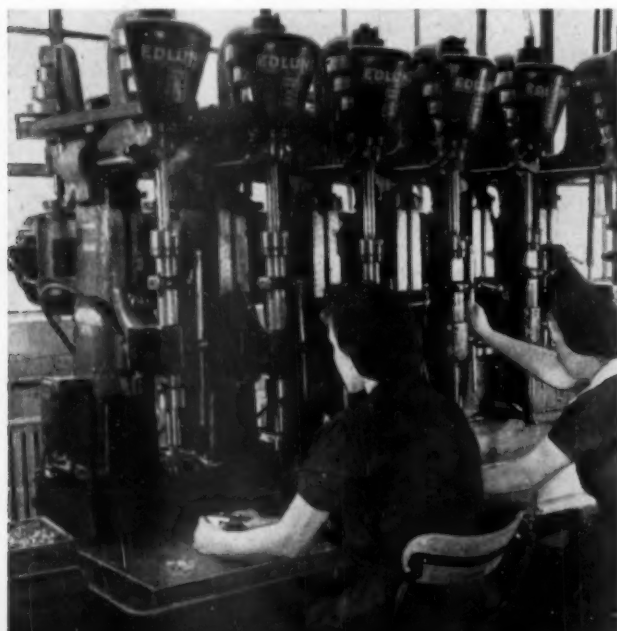
One of the first machining operations on the die cast gimbal ring consists of boring—on high production, precision equipment—the core holes. This operation is performed within tolerances of .0002" and .0003" limits.

Earlier methods employed jigs and drill presses.

In tapping the machined core holes for the assembly of the aluminum bearing housing, a production tapping machine with lead screw is used, replacing an inaccurate hand operated threading fixture. The part is mounted so that both holes for the bearing housing are in line. A plug pushed up through the holes received the pilot on the tapping tool. The plug is pushed ahead of the tool, offering a perfectly aligned course for the tap, yet not requiring to be drawn back through the tapped holes. The smaller diameter pilot is raised through the finished holes without touching the threads.

The bearing housing which fits within these holes offers an interesting example of a part which had been produced by low activity methods, and which seemed to defy production on standard high activity equipment. Formerly, a $\frac{7}{8}$ -32 American National Thread had been chased on an engine lathe. When production schedules were raised, Ternstedt engineers experimented with thread grinders. A hard wheel proved suitable for producing threads on this relatively soft aluminum alloy.

Left, drilling small parts on 6-spindle drill press. Two operators divide work to speed machine output. Below, drawing of gimbal ring shows precision tapping details.



Streamlined Production

Streamlined Production

Mechanical Methods Save Welding and Fitting of Manifold Parts

PRODUCTION of exhaust manifolds for B-17 and B-25 bombers was a tedious series of operations when undertaken without benefit of welding fixtures, spot welders, and a mechanical expansion die. Fisher Body designed and built its own fixtures, many of them innovations to the aircraft industry. In one instance, three sub-assemblies are welded together on a fixture constructed to hold five section ends in place. This has resulted in a weldment of less distortion than when sections were paired.

On one end of a manifold, a ring is fitted and the section-end is expanded within the ring to provide a tight fit. A hand operated expansion die required ten minutes to complete this fitting operation. Design of a die to perform the operation on a non-critical punch press reduced the operation time to two a minute.

In welding the ring securely to the section-end, a torch welding operation was changed to spot welding. This resulted in a superior weld and required less time.

One other machining operation on the manifold, pre-



Above, old method of expanding manifold section. At right, new method uses punch press.



paring long seams for welding, saved 25 per cent of the machining time formerly required. A nibbling tool set to allow a 1/16" bend for welding replaced cutting with a band saw and deburring.



Above, torch welding ring on end of manifold was time consuming and demanded skilled operator. At right is shown the spot welding development which Fisher Body engineers instituted. Use of nibbler to prepare for seam welds was an innovation.



Streamlined Production

Turning to .0002" on a Lathe

CONSIDERABLE ATTENTION has been paid by Ternstedt production engineers to tooling details, which though not as spectacular as other phases of their war production achievement, nonetheless are important to the total accomplishment. As well, they reflect the thoroughgoing job which these former automotive "craftsmen" have carried into this present job.

An excellent example is shown in the design and application of a combination steady rest and center for a small precision lathe. It has permitted turning a part to within .0002", considered extremely difficult on a lathe.

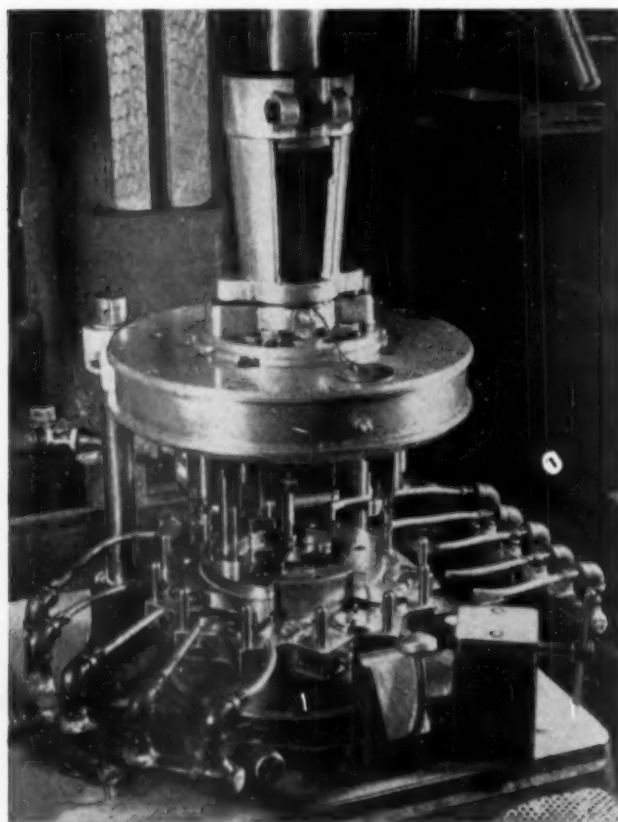
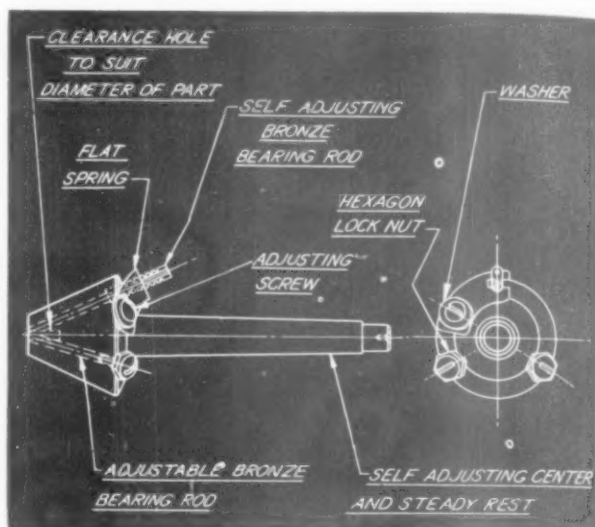
In almost every respect, this novel accessory varies from the conventional. In the first place, it is chucked in the tailstock of the lathe. Though conventional drive from the headstock is employed, and a share of support to the work is maintained there, the entire burden of centering the pivot spindle of the part which must be turned in close concentricity to a previously machined part on the same axis, rests upon the centering device on the tailstock.

The device consists of a cone, incorporating three brass rods, inserted parallel to the taper. The conical shape is necessary to afford clearance for the cutting tool, close to the steady rest. At the same time, the angle of the rods permits bringing three points to bear so that a surface

greater than that of a cross-section perpendicular to their axis grips the part.

Two of the bars are held in fixed position, backed by screws. The third is held against the work by spring tension. With one of three points adjustable, the centering action is achieved. The angle of the bars against the work offsets or resists any back thrust or up and down motion.

Where flats were milled on each side of a round pointer guide arm, a simple punch press operation, employing a flattening die produces parallel surfaces. The planes must not only be parallel within .001" thickness, but must also be concentric with the pitch of a thread on the portion of the arm which is 90° to the flats.



Indexing Fixtures

INDEXING FIXTURES save both man hours and machine hours because machines are not idle while parts are chucked or located, operators can pre-load while machines are running.

Two rotary indexing fixtures developed by Ternstedt engineers illustrate further possibilities for doing precise instrument work with high production methods. One fixture is used to drill five holes in the flat, closed end of a small cylindrical housing. With 10 drilling stations, and two loading and unloading stations, two parts are completed with every index, once the table is in full operation. Drill Spindles are equidistant from the center, as are collets on the indexing table. With every index, collets automatically turn to position the part for the next drilling.

Only requirement of the operator is to tighten and loosen a bolt with a hand wrench as each collet is presented at the loading station.

Another rotary indexing fixture on a milling machine is comprised of four loading stations and one machining station. This permits continual operation of a large, inserted tooth end mill which faces four pads on the base of an instrument case. Parts are quickly located by means of angle stops and held with quick action toggle clamps.

Multiple head on standard drill press is used in combination with indexing fixture for drilling five holes in small part.

THE TOOL ENGINEER

Streamlined Production

.187 MAX. OPENING
.437 IN FREE POSITION

PITCH LINE

4.304
 $\begin{smallmatrix} +.000 \\ -.008 \end{smallmatrix}$

DIA.

1.6
 $\begin{smallmatrix} +.000 \\ -.000 \end{smallmatrix}$

2.34
 $\begin{smallmatrix} +.000 \\ -.000 \end{smallmatrix}$

WORKING RANGE

TEETH MUST BE PERFECT
FOR THIS DISTANCE.

SECTION A-A

4.437
 $\begin{smallmatrix} +.000 \\ -.000 \end{smallmatrix}$

DIA.

.340
 $\begin{smallmatrix} +.000 \\ -.000 \end{smallmatrix}$

.437
 $\begin{smallmatrix} +.000 \\ -.000 \end{smallmatrix}$

.187
 $\begin{smallmatrix} +.000 \\ -.000 \end{smallmatrix}$

WORKING RANGE-TEETH MUST BE PERFECT FOR THIS DISTANCE

PITCH LINE

2.16

8.916

0.062 ± .005

32 PITCH TOOTH FORM -
14 1/2° FULL DEPTH
INVOLUTE SYSTEM

4.20 ± .004

9

In the final operation, the strip is curled into a ring of correct dimensions. A small bending machine, employing two rollers against a larger driven roller produces the

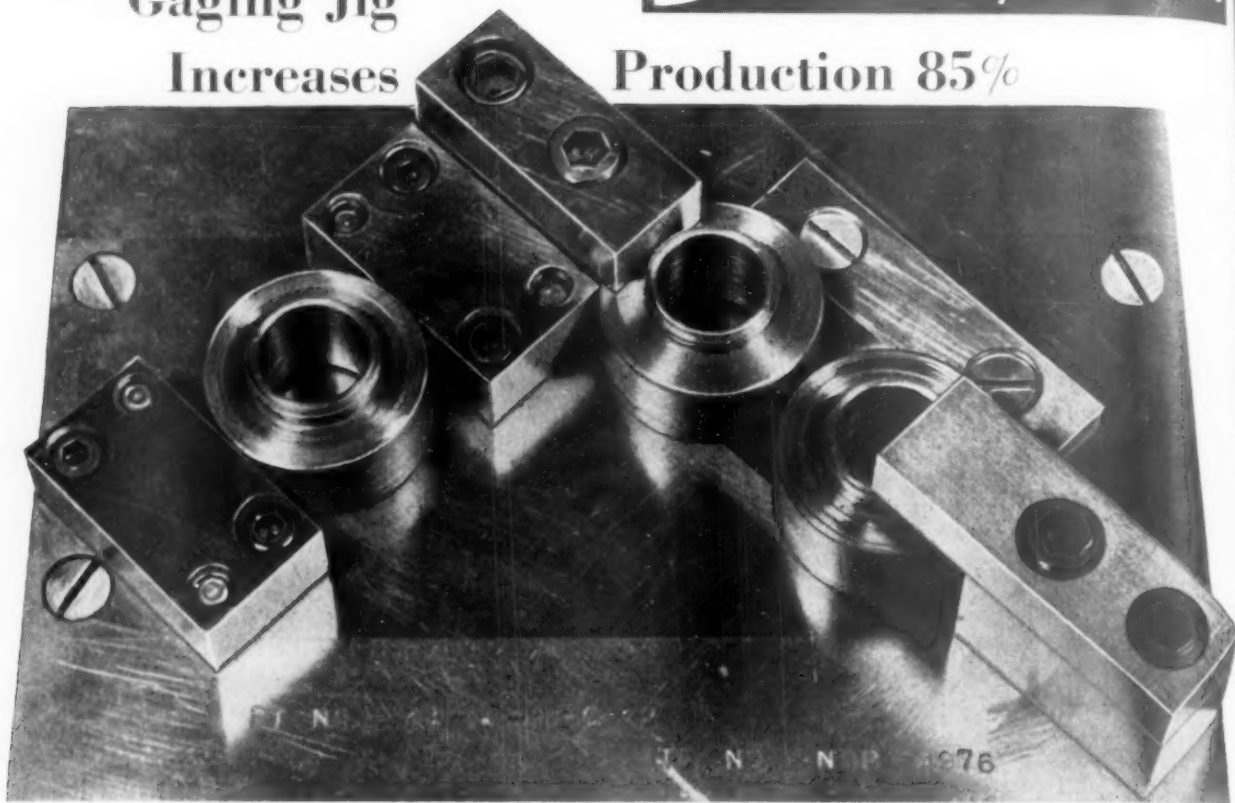
completed ring gear. Shallow knurls on the driven roller provide sufficient friction to grip the strip; a crown in the roller offsets the strains which tend to produce a concavity on the O. D. of the ring.

A black and white photograph of a large industrial machine, likely a steam engine or boiler, with a large circular hatch and various pipes and valves. The machine is situated in a dark, industrial environment. The circular hatch is prominent in the center, with a smaller circular opening in its middle. To the left, there are vertical pipes and a large valve. To the right, there are more pipes and a smaller valve. The machine appears to be made of metal and has a complex, mechanical design. The background is dark and indistinct, suggesting an industrial setting.

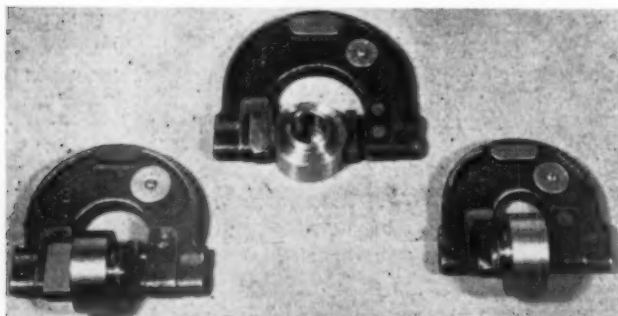
Gaging Jig Increases

Streamlined Production

Production 85%



Gaging jig shown above was devised by Fisher Body employee. Replacing use of separate snap gages as shown below, this is typical of improvements which operator on the job is in a position to suggest.



OVERALL CHANGES, as from forging to die casting, have headlined Fisher production progress. But many small improvements have resulted in improved production flow. Certain of these are worth special attention, because they are typical of day to day developments which help to keep bottlenecks at a minimum. They are also typical of changes which other plants are making and which every plant is in a position to make.

Many of these improvements result from employees' suggestions. In the Ternstedt Manufacturing Division of Fisher Body, a woman employee suggested a design for a gaging jig which increased inspection of bearing cups from 290 pieces per hour to 538 pieces per hour.

The jig was made to incorporate positions for checking three different dimensions. The jig replaced three con-

ventional snap gages which had been used independently, necessitating more handling, and a degree of confusion in picking up the right gage to check each dimension.

In plants employing green labor, such a change to a more well-ordered set-up would result in improved checking and better care of gages, as well as in increased production.

Self-Equalizing Vise

ANOTHER EMPLOYEE'S SUGGESTION resulted in changing the design and method of using a vise so that a number of pieces of varied thickness can be clamped simultaneously in the same vise. This improvement has increased surface grinding output on certain parts as much as 115.5 percent.

Known as a self-equalizing vise, the face of the tool is hollowed and filled with modeler's clay which will not dry and harden. Floating pins are located in the face, and as the two vise faces are drawn together by the action of a floating C-clamp, the pins make contact with the work. Pressure inside is increased until a suitable clamping pressure is reached.

Because of the uncompressibility of the clay and the adaptability of the pins to any variations in stock thickness, equal pressure is achieved.

The design of the pins can be varied with the stock being clamped, the only requirement being that they float in the clay. Though this type vise has been used only on surface grinding, it should work as well on other types of operations where clamping is necessary. **THE END**

CONVEYORS

Are Production Tools

Here are examples of maintaining work banks for small parts machining, fabricating a bomb casing, balancing continuous and intermittent operations, ingot pouring and cooling, and automobile body transfer

MASS production techniques, from forming or machining to assembly in motion, depend largely upon conveyors. Application of these techniques is considered practical by any industry having reasonable volume and standardization.

Results are usually low labor costs with high individual earnings, reduced inventory of work in process, minimized spoilage, and avoidance of repeated handling of work in and out of storage.

Viewing typical plants in a broad cross-section of industry, shows that conveyors, when properly installed, function as a production tool.

Machining small parts

IN ONE PLANT, ingenious utilization of standard types of conveyors and storage bins provides a continuous flow cycle to small parts produced on standard machine tools. Where large punch presses are used to stamp out bar stock in the manufacture of automobile hardware, the stampings drop out of the back of the presses and are picked up by a continuous type bucket elevator and discharged into storage bins or hoppers. From the hoppers, the parts flow by gravity through tumbling barrels and heat treating or washing machines. Finally, they are conveyed, by elevators if necessary, into other storage bins.

In supplying work to an automatic milling machine, parts flow by gravity to a bin located adjacent to the machine. The operator feeds the machine from this location, and the parts are discharged from the back of the machine to another elevator and storage bin system. This arrangement provides a continuous flow of parts as well as a bank between the various operations.

A third set-up in this plant facilitates the flow of work from a row of

J. L. BISHOP
VICE PRESIDENT
MECHANICAL HANDLING SYSTEMS, INC.

standard punch presses which are producing a part through progressive operations. As each operation is completed on one press, the part falls out of the back of the press onto an inclined belt elevator, which in turn discharges to a portable storage hopper with a front discharge to which work flows by gravity to the next operator.

This cycle can be repeated as many times as necessary to finish the part. In addition, flexibility is afforded in that banks can be removed from the line.

Automobile radiators

IN LOCATING a new plant for the manufacture of automobile cellular type radiators, a site was selected in a small midwestern town, having good transportation facilities, but no

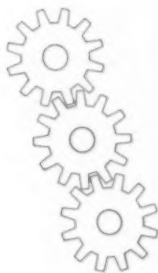
skilled labor supply. Where previous fabrication had been in a plant affording a limited number of material handling devices, skilled operators were available, or had been trained through the years, to combine a number of varied operations on each part.

Laying out the new plant, therefore, called for a breakdown of operations so that an average farm worker would be able to master them and turn out a first-class product.

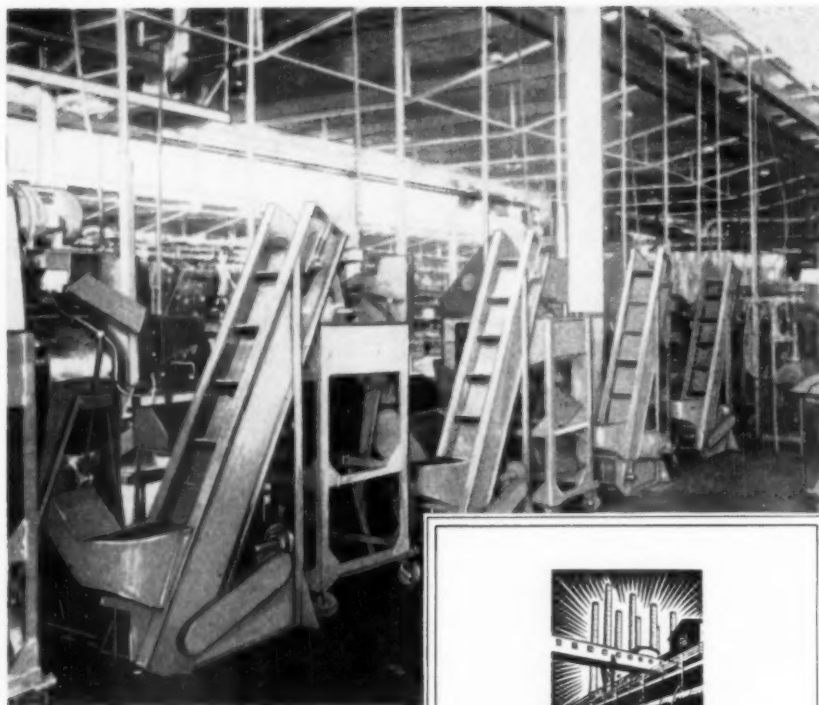
Generally, the overall layout consisted of a plant with one railroad siding coming in one side to deliver raw materials, and another track on the opposite side for shipping finished products. Materials entering into radiator construction are sheet brass, copper and castings.

Brass sheet is moved down a line consisting of a series of standard punch presses for the forming of the top and bottom tanks of the radiators. They move through a progressive operation on a belt conveyor, leaving the end of the line as com-

Beginning on this page, THE TOOL ENGINEER presents articles which originated as papers delivered at the national semi-annual meeting of the American Society of Tool Engineers. Other papers of equal interest will be published in early issues.



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Bucket conveyors and storage bins help parts supply on punch presses.

Maintaining a bank of small parts for a progressive stamping operation is a productive function of this setup.

pleted stampings. From there they are transferred to a tank delivery "Monoveyer" which is a chain driven monorail system, providing special carriers to receive tray loads of the tanks.

Three elevations on the carrier permit classification of different types of tanks and operations. As they travel along the monorail, they are removed for sub-assembly operations, such as soldering on inlet and outlet castings and filler caps. Returned to the tank delivery monorail, they are carried to the final assembly line.

Ingenious handling of ribbon stock for fabrication of the cellular core is illustrated in delivery of the stock to automatic forming machines. The machines are placed adjacent to and in front of a monorail conveyor. Carriers are provided with different elevations which separate the various types of ribbons, and the conveyor is made to run in different elevations so that the correct shelf automatically aligns itself with the right machine.

Sub-assembly monorail conveyors for tank sections and core sub-assemblies end at the final assembly department. Core ribbons are removed in their trays and then slid from the trays directly into lock-up frames for face soldering. A number of conveyors combined into one unit permit assembly in motion.

The first part of the unit consists



● Efficient, economical work-flow depends upon handling planned according to space limitations, the output requirement and the breakdown of operations necessitated by untrained labor.

of a series of surface plates attached to chains to provide a continuous work table. The surface plates are used in squaring the face of the core in the lock-up frame. As the frames progress down the conveyor, inspection is made for defective ribbons, and the bottom tank is inserted at the point of intersection with the monorail conveyor previously described.

Lock-up frames are picked up from the first chain conveyor by a second chain conveyor which is intermittent in operation. At the first stop, the face of the core is automatically dipped in soldered flux and at the second stop automatically dipped into a solder pot having a constant solder level. The core is discharged to an unloading position, where an operator unlocks it from the lock-up frame. The frame is picked up by an overhead chain and automatically returned to the surface plate conveyor.

After the core is removed from the lock-up frame, it is placed directly in a fixture with the top tank, which is received from the tank delivery conveyor. The fixtures are part of a conveyor, designed to index automatical-

ly and progressively to correct soldering positions so that each operator on the conveyor performs a small portion of the soldering operation.

Following removal from the top tank assembly conveyor, radiators are placed on a system consisting of three separate "Monoveyers", the center one delivering the radiators to an operator at each one of a series of testing tanks. After the test, the radiators are placed on either one of the outside conveyors for delivery to the sidewall assembly operation, performed on another power driven unit similar to the one described for the top tank assembly.

Completed radiator assemblies are conveyed on another system through a final washing operation. They pass in a circular path through a machine which sprays them externally and flushes them internally to remove all traces of acid flux. Internal flushing is accomplished by a series of flexible hoses, suspended from a large central sprocket driven by the conveyor chain. The operator need only attach the hose to the filler opening of the radiator, and water is turned on and off automatically as the radiator passes around the machine.

Radiators are inspected finally and then transferred to a monorail conveyor carrying them through painting and drying operations. A two deck drying oven is used, first to dry unpainted parts before painting and then to dry painted parts. Paint is sprayed with automatic stop and start, including prevention of the paint operation should there be an empty hook. Painted units return to the drying oven, and from there are conveyed along the shipping dock.

Demolition bombs

THROUGH proper planning and use of conveyors, a small plant has been laid out to produce demolition bomb casings in large quantity at low cost per unit. The plant is equipped with two railroad sidings, one at one side for incoming raw materials, and one inside the plant for the shipment of finished casings. Casings are produced from seamless

tube which is received in long lengths and handled by an overhead crane, traveling the length of a runway. The crane handles pipe in units of three by means of a special sling, loading them on a skid rack equipped with an automatic discharger for loading each tube onto a friction saw carriage.

After sawing, the pipe travels forward through a pair of deburring rolls to clean up the edges, and from there it is conveyed into the building for forging operations.

The duplicate lines of forging machines each consist of three machines, two required to form the nose and a third for forming the tail of the bomb casing. The pipe delivery conveyor runs between these lines, discharging the bomb pipe automatically to the loading end of each furnace, where an operator transfers the pipe to the heating ports with a semi-automatic carriage. The same carriage is used to remove the pipe from the furnace and bring it rapidly into position on the forging press.

Further travel on conveyors

After each forging operation, the casing is either discharged directly to the next furnace for reheating, or automatically to a cooling conveyor located underneath the pipe delivery conveyor. After forging operations are completed, the casing is again delivered to a final cooling conveyor which is enclosed and provided with a forced draft for rapid cooling. It is delivered from the end of this conveyor to a tack welding operation for placement of the suspension lugs.

Other conveyors distribute the bomb casings for further welding operations requiring a number of operators. The lower deck of a two deck monorail conveyor delivers to the welders, and an upper deck carries welded assemblies to the furnaces.

Between duplicate hardening and draw furnaces, an automatic quench is located. Bomb casings are carried through the entire heat treat by means of shoes that ride on rails. At the discharge end of the furnace, the shoes are picked off the rails and returned to the loading end on an auxiliary conveyor. Casings flow by gravity from the discharge end of the hardening furnaces, and an automatic pull test is given the suspension lugs as they pass this gravity roll conveyor.

Casings are handled through shot blasting equipment by means of an

overhead transfer crane, and are deposited on an inspection rail. The rail is equipped with a loading device for the delivery monorail conveyor, which circulates and delivers the casings to the final machining operations which consist of facing, boring and threading the nose and tail.

These machining operations are performed simultaneously on specially designed machines. A rotating fixture permits loading and unloading while the machine is in operation. A small overhead hoist loads and unloads the fixture, returning finish machined work to the delivery conveyor for removal to inspection and painting operations.

One monorail conveys the work through degreasing and automatic spray painting operations. Degreasing also serves to heat the metal to a desirable painting temperature. Rotating fixtures facilitate painting. Following a ten minute hardening period, the bomb casing is removed from the vertical position on the conveyor to a horizontal position on the final assembly conveyor.

Component parts are furnished from inspection benches located adjacent to the final assembly line. They have been machined on standard screw machines and special multi-spindle drilling machines. A small parts delivery monorail conveyor circulating among the machines delivers

parts and carries them away to a degreaser and on to the final inspection benches.

The final assembly conveyor carries finished casings through a spray booth for paint touch up. An overhead electric hoist and track moves them to racks on casters, which carry the product directly to box cars where a portable overhead track equipped with a hoist loads them into the cars.

Foam rubber seat cushions

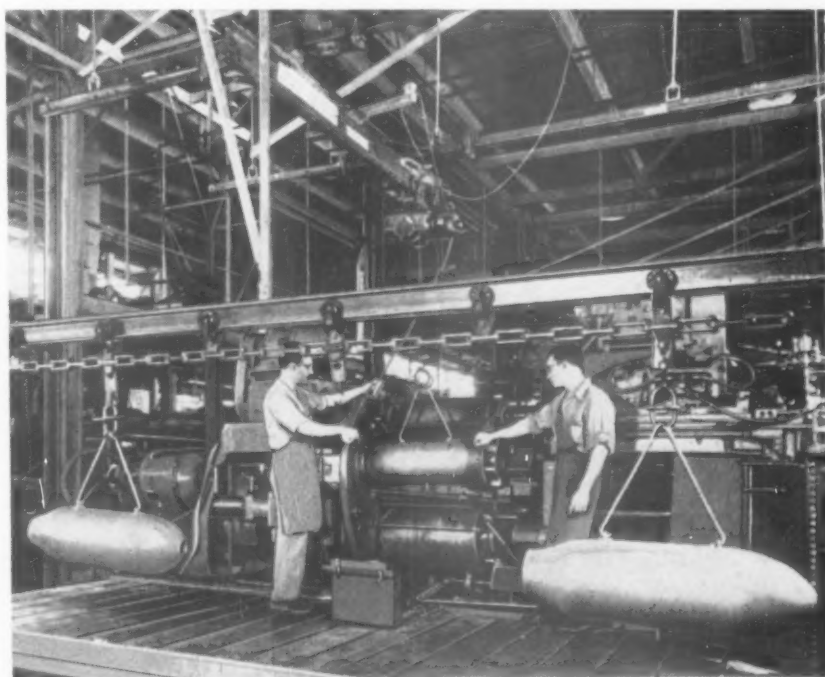
THE LAYOUT of an automatic system for mixing, pouring and vulcanizing foam rubber seat cushions is a fine example of what can be done with a product that must be handled continuously in some of its processes and intermittently in others.

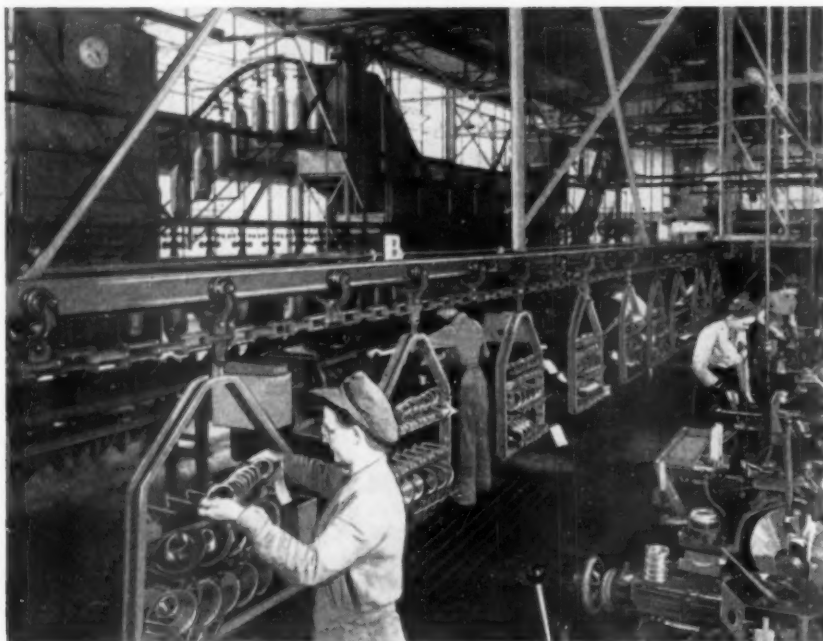
Two duplicate conveyor systems handle the large moulds into which the Latex is poured and vulcanized. The moulds are box type, the bottom portion mounted on rollers and the top hinged to the bottom.

The ingredients in the mix are measured in a container and then poured into standard bakery type mixers, ten of which are mounted on a power driven turntable. The speed of travel to complete one revolution is controlled so that mixers arrive at the discharge point just as the mixing process is completed.

The mixing bowl containing the

Monorail conveyor, supplemented by overhead hoist feeds a machining fixture. Conveyor and rotating fixture keep machines busy on demolition bomb casing operation.





Small parts delivery conveyor supplies parts to machines and inspection benches. Monorail conveyor provides easy accessibility and space to keep all machines busy.

Latex is removed by means of an overhead hoist and poured directly into the moulds, which travel along the main pouring conveyor. As the moulds pass through the pouring zone, an overhead cam type track lowers the lid of the mould to closed position, ready for vulcanizing. The long run on the pouring conveyor permits the foam rubber Latex to set sufficiently for handling of the mould into the vulcanizers.

As the moulds reach the end of the continuously moving pouring conveyor, they are discharged automatically into a special elevating or stacking device having wheel tracks corresponding to those of the pouring conveyor. The "stacker" is capable of holding fourteen moulds and its speed of operation is timed and synchronized to the operation of the conveyor so as to bring open or empty tracks into position as the conveyor brings

each pair of moulds to the transfer point.

When a stack of fourteen moulds has accumulated, a transfer car is brought into position containing a cage structure which matches with the tracks on the elevator or stacking device, and an overhead pusher arm pushes the fourteen moulds out of the elevator into the cage.

The transfer car then moves the cage into position in front of a vulcanizer and the conveyor on the transfer car pushes the cage with its load of moulds stacked fourteen high into the vulcanizer. One man on the transfer car controls the entire operation.

After the 20 minute vulcanizing period, the door of the vulcanizer opens automatically. The transfer car is aligned with the vulcanizer and the cage load is transferred to an unstacking device which delivers the moulds in pairs to a continuously moving pusher-type stripper conveyor. The stripper conveyor carries the moulds past a cam-type track which raises the lid tops of the moulds to vertical to permit removal of the vulcanized foam rubber. As the mould is carried along the conveyor, the cam-type track carries the lid past vertical into a more open position to permit spraying with dope and air conditioning the mould to the proper temperature for the next pour.

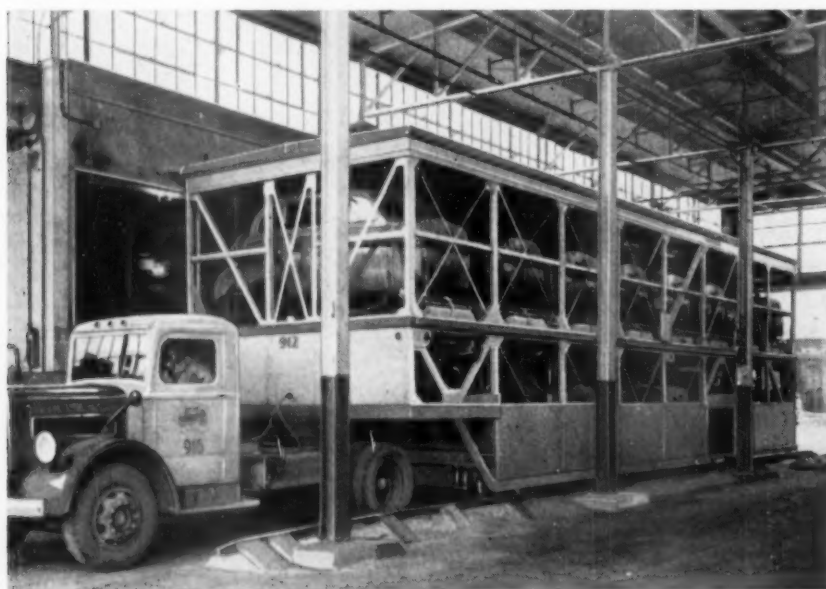
As the mould reaches the end of the conveyor, the top is again brought into vertical position, and the mould transferred back onto the pouring conveyor, by means of an intermittently operated transfer conveyor. Control of all these conveyors is centered in an electric panel.

Continuous pouring, cooling

A SMELTER, faced with increasing production without increase in floor space, developed a new layout in which a single chain conveyor performs the function of all mould and metal movement. Only two men are required to operate this system, as compared with 20 previously needed.

One operator controls the flow of metal from the furnace into the pouring basin. From the basin, it flows continuously into a pouring ladle which has six spouts so that six moulds can be filled simultaneously.

The pouring basin is mounted with a front support on trunnions, while the rear may be raised and lowered by means of a hydraulic cylinder con-



trolled by the man shown in front of the furnace. The conveying system consists of a monoveyor with racks on 6-foot intervals, each rack carrying six cast iron ingot moulds. These moulds are mounted so as to be rotatable 180° transversely, and the operation of the system is intermittent, having approximately four cycles per minute.

About nine seconds are consumed in pouring the six ingots, and six seconds of each cycle in the movement of the conveyor bringing up an empty or unpoured rack. The moulds progress around the system and around a cooling loop, and then pass over a large water filled tank. Over the tank, moulds are turned over and ingots drop into the water for final cooling. An apron conveyor carries ingots from the tank to a dolly for transporting to storage or shipping.

Emptied moulds are sprayed with water, while upside down, until sufficiently cool and then automatically righted for the next pouring cycle. A part of the system is a charcoal dispenser adjacent to the furnace which automatically discharges an adjustable amount of powdered charcoal in-

to each mould. This practice gives a smooth top ingot.

Moulds are preheated before pouring by gas jets located on the runner conveyor in front of the furnace.

Automobile body transfer

IN THE MANUFACTURE of automobiles, the body plant is generally separated from the assembly plant. The manufacturer is usually faced with the problem of transporting bodies in a continuous flow.

To accomplish this, one manufacturer designed a fleet of special trailers capable of transporting 14 bodies at one time. The unusual feature of the trailers concerned the method of loading and unloading the trailers.

The bodies are carried on standard dolly trucks used on the plant fabricating system. Each compartment of the trailer is equipped with tilting dolly tracks, crosswise to the trailer, and hinged with connecting tracks that also form a means of locking the dolly trucks in place in the trailer. The tilting dolly tracks, together with the hinged sections are power

operated from within the trailer.

To load the trailers, a special dock was constructed, having compartments and dolly tracks to correspond with those in the trailer. The bodies on the dolly are delivered by the plant conveyor system to their respective positions on the loading dock.

Dolly tracks on the dock are inclined either toward or away from the trailer, for loading or unloading. To align the trailer with the dock, the trailer is driven between T-rails. Flanged wheels, front and rear, in addition to the regular rubber-tired wheels, engage the rails and maintain proper distance between trailer and dock.

When in correct position, the driver pushes a button releasing the dollies and bodies on the dock. All 14 dollies roll down the inclined track and into the trailer simultaneously. Approximately six seconds are required for the transfer.

At the unloading dock, the same procedure takes place, except that the tilting tracks in the trailer are inclined in the opposite direction by a power unit contained in the trailer.

Mobile Materials Handling Equipment

IN the aviation industry, effective use has been made of modern materials handling methods to speed production. The larger plants, such as Boeing in Seattle, Douglas and Lockheed in California, and related plants in the East and middle west, all use the fork truck as a part of a plant transport system.

The fork truck, besides handling thousands of carloads of incoming material from car to storage and use, has been found suitable for storing and handling drop-hammer dies and hydraulic press dies. Because output of any given plane part is much smaller than in the automobile industry, for example, frequent changing of dies is required.

Through the cooperation of the material-handling engineer, the plant engineer and the tool designer, this problem—one of the most difficult in aviation production—was solved.

The fork truck brings the die from storage and places it directly on the bed of the drop hammer or hydraulic

Condensed from a talk by
EZRA W. CLARK
VICE PRESIDENT AND GENERAL MANAGER
CLARK TRUCTRACTOR

press. After the die has served its purpose, it is returned to storage by this means. Dies are made of white metal, largely zinc, and weigh approximately 400 pounds in smaller sizes, and as much as 10,000 or 15,000 pounds in larger sizes.

Problems of lift and carry were comparatively simple, when it came to designing a fork for this job. But the necessity of sliding the die on and off the press presented a difficult operation.

This was accomplished, however, by the introduction of two hydraulic rams, one on each side of the machine, suitably connected to a pusher bar mounted on top of the fingers. By operating a lever-controlled valve, this pusher bar is made to travel back and forth along the top side of the fingers. Since the operation of moving

the pusher bar must take place at varying elevations, hydraulic cylinders are mounted at a carefully selected fulcrum point.

The introduction of two large gears revolving upon vertical shafts, and meshing with two other gears of equal pitch diameter, enables the operator to control the movement of the pusher bar so that it is always at right angles to the direction of travel.

By the application of suitable crane attachments, the fork truck is also used to lift and place engine assemblies and propellers into proper positions in airplane wings. This operation can be done by the fork truck only after the plane leaves the assembly line. The fork truck is also used when the engine must be replaced on the flight apron of plants and hangars where servicing of the engines must be done.

The fork truck also is used to move planes from the assembly line, raising the tail of the ship with a special fixture.

THE END

How designs evolve from the engineers' objectives and manufacturers' requirements

Part 2 of this article, "Developments in Surface Finishes," begins on page 92



Allison Division photos

FIGURE 1. Shadowgraphs of various airplane forms around V-1710 engines.

THE ALLISON ENGINE

PRODUCTION AND DESIGN FEATURES

DIMITRIUS GERDAN

ENGINE DEVELOPMENT ENGINEER
ALLISON DIVISION
GENERAL MOTORS CORPORATION

IN DEVELOPING aircraft engines for production, Allison engineers raised many questions regarding lack of design flexibility. For example, in one engine, a large bearing housed at the front end of the crankcase made changes in ratio of an internal type reduction gear entirely impractical for development or production tooling because it involved major changes. The overhung pinion on the

crankshaft constituted an immediate limitation on increases in output of the power section, particularly since it was one member of the supercharger drive which extended from the reduction gear through a long shaft to the rear of the engine.

Such limitations led to forming rules for future designs to achieve maximum installation and production simplicity, interchangeability, and flexibility. Need for left and right hand rotation, and for various reduction gear ratios all pointed to major re-design.

Accordingly, the Allison Division, in 1937, designed a line of engines affording airplane designers unheard of latitude in disposition of the engine, cooling system and reduction gearing.

Figure 1 shows various engine locations in airplanes, and Figures 2 and 3 show basic models, the V-1710-E and the V-1710-F. The "E" engine, incorporating the remote gear box with hollow propeller shaft for cannon use, is located behind the pilot and connected to the gear box through extension shafting. The "F" engine is completely interchangeable with the "E" from the front face of the crankshaft rearward, for any given altitude and hp. rating.

Both engines can be readily furnished with various supercharger gear ratios, extension shaft lengths, and can be supplied for pusher propellers without the necessity of a re-design of the basic engine.

Both engines have been furnished in several models in right or left hand rotation, with sea level or altitude supercharging, and at various power ratings starting at 1,150 hp. With all these changes, and a 15 per cent minimum increase in power, engine frontal area was 10 per cent less than that of the first production engine, and weight was 5 per cent less.

In 2½ years of high production, a total of 19 models have come off the line with as many as seven going through in one day. Model changes have involved reduction gear ratios, supercharger drive ratios, and a steady increase in horsepower. Superimposed upon these have been continuous improvements in parts. Practically 100 per cent of these improvements can be applied to earlier models.

Flexibility in production and installation of the current Allison engine design arises chiefly from complete separation of the Power Sec-

tion, the Accessory Drive and Supercharger Section and the Propeller Drive Section.

THE POWER SECTION

THE POWER SECTION consists essentially of the rotating and reciprocating parts, the static cylinder block and crankcase structure, the distributing means for the fuel-air mixture, and the harness required for the conduction of current to the spark plugs.

The "E" and "F" types provide the airplane designer a choice of engine mount. In addition to the rail mounting, side pads on the crankcase are equipped with Aero thread inserts so that crankcase and engine assemblies are interchangeable in service whether the airplane calls for studs, cap screws, or none at all. This simplifies engine testing and assembly of various models both in our plant and in service. Exhaust spark plug cooling tubes are standard equipment since they are required on pusher and exhaust turbo installations.

The crankshaft is the backbone of any engine. On an in-line engine, the crankpin arrangement determines firing order, balance, torsional vibration characteristics, and even fuel and air distribution characteristics of the manifold. It was desired to retain the firing order per bank, around which an intake manifold had been developed, and at the same time provide for either right or left hand rotation.

As shown in Figure 4, it is possible to obtain the same firing order per bank for either rotation by the simple expedient of making the ends of the crankshaft identical. Maintaining firing order permits the use of the same camshafts as these are always rotated in the same direction. Also, no change is required in intake and exhaust manifolds.

By stamping or marking one end of the shaft, and always numbering and assembling the connecting rods from this end of a 12-cylinder engine, relative movement between the blade and forked rods can be kept the same so that optimum relation can be obtained for either direction of crankshaft rotation.

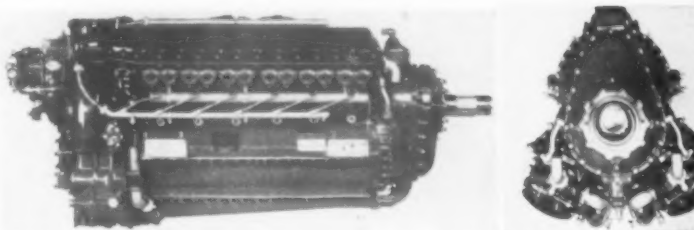
View D, Figure 4, shows an assembly of the crankshaft and rods. This does not become a right or left hand unit until the flange attaching parts are bolted on. By using flanges in



FIGURE 2. Left side view of V-1710-E engine, shafting, and gear box.

FIGURE 3.
(Right)

Front and right
side view of V-
1710-F engine.



place of splines and modified oiling to simplify drilling, the flanged design crankshaft has 11 fewer machining operations, in spite of the flexibility feature in the former. Man hours were reduced about 13 per cent on production of this shaft. In addition, the elimination of the splined ends caused an appreciable scrap reduction and relieved hand fitting.

The cylinder block assembly consists primarily of a cast aluminum alloy cylinder head into which valve inserts and cylinder barrels are shrunk. The cylinder barrels are then surrounded with a cast aluminum alloy cylinder jacket which distributes and directs the flow of coolant. Coolant enters at the bottom rear of the jacket and at the rear end of the cylinder head, while the outlet is taken from the front of the head. In pusher installations, coolant may be taken from the rear end of the block.

By a simple change in the sizes and arrangement of orifices which distribute flow to each cylinder, the cylinder assembly can be converted for use in tractor or pusher airplanes. Vent line openings are provided at either end of the head for proper venting regardless of the attitude of the engine in an airplane.

Sealing against coolant leaks is provided by metal-to-metal joints throughout the block. The lower end of the coolant jacket is clamped against the cylinder barrel flange by a spanner nut and is sealed at its upper end at the cylinder head split-line by closely spaced studs. This permits testing the cylinder block assembly with hot "Prestone", which is extremely desirable because the leakage tests become a production operation, eliminating penalty runs which might occur if sealing were not accomplished before final assembly.

Crankcases are machined from heat treated aluminum alloy castings and

are mated together at the time the main bearing bores are machined. Alloy steel main bearing studs and small, closely pitched studs at the split-line, hold the two cases together.

Almost three years ago, Allison introduced angle tightening specifications for drawing up the nuts on the main bearing studs. This also has been applied to other highly stressed studs and bolts. The former use of torque wrench tightening methods gave as much as a 2-to-1 variation in stud and bolt loading.

An extensive series of tests in which the tightening torque was correlated with the magnitude of stud stretch revealed that it was nearly impossible to maintain thread lubrication and thread variations, closely enough to avoid large differences in stud loads. Since the elongation method of tightening studs and bolts was considered too cumbersome and slow for production purposes, a change was made to the angular method.

In assembling crankcases, the two cases are seated together by drawing up the main bearing stud nuts and the split-line nuts with just enough load to insure seating. Then, the main bearing stud nuts are loosened, one at a time, brought to a "finger-tight" position, and then tightened through a specified angle. This procedure has eliminated the objections encountered with torque wrench tightening by resulting in elongation limits of about plus or minus 10 per cent.

ACCESSORY HOUSING AND SUPERCHARGER SECTION

THE ACCESSORY HOUSING and supercharger section is a highly compact arrangement of the necessary accessory supercharger and camshaft drives. Much care was used in the design to provide, wherever possible, right angle drilling for all oil passages and boring operations with the

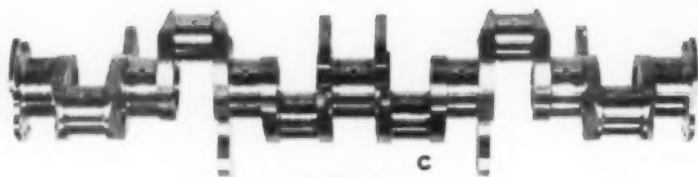
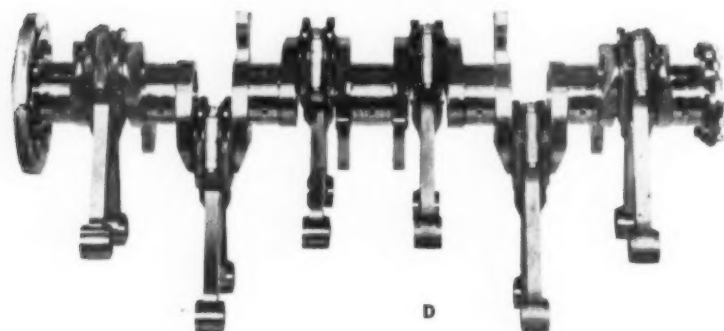


FIGURE 4.
Crankshaft and rod assemblies.



A
(Left)



B
(Right)

exception of the camshaft drives, which of necessity are at angles in relation to the other drives.

The shape of the accessory housing was governed by the necessity of providing for straight through beam rail mounting for certain airplane designs. Accessories and coolant piping are so

located that there is no interference with the rail mount.

Accessory drives all stem from the center shaft which is piloted and splined to the crankshaft rear member. Reversing all accessories except coolant and oil pumps takes place by inserting an idler in the gear train

from the central drive and by turning end for end the two bevel gear drives to the oil and coolant pump. The only additional part required to build a left hand engine is the starter dog.

A splined shaft couples the assembly to the crankshaft, a splined flange being bolted on the latter. This flange also acts as a carrier for the torsional vibration damper. The accessories driving shaft incorporates the hydraulic damper unit which provides hydraulic damping for both high and low frequency crankshaft systems as are obtained with direct coupled reduction gears as in the "F" engine, or with extension shafting, as on the "E" engine.

The accessory housing section, when assembled, is quickly coupled to the Power Section at the rear end of the crankcase through the studs provided on the latter. The camshaft drives, telescopic in design, are easily assembled to the cylinder blocks.

PROPELLER DRIVES

FLEXIBILITY OF LOCATION of the Power Section in airplanes can be obtained by the suitable use of extension shafting to remote gear boxes and will give almost any engine and propeller drive combination desired by the airplane designer. For example, several feet of extension shafting and an outboard gear box with a hollow propeller shaft enable cannon firing through the shaft.

THE ALLISON ENGINE:

Developments in Surface Finishes

A striking difference between aircraft engines and those used for other purposes lies in the large number of finely finished parts specified in the former

THE PRIMARY REASON for specifying fully finished parts for aircraft engines is that economy of weight can be obtained. Secondly, visual, including magnetic, inspections can be more readily made. Also, the life of the part can be increased considerably.

In any mechanical part which is subjected to repeated stresses, connecting rods or crankshafts for example, the surfaces, are much more subject to fatigue failures than re-

gions below the surface. This vulnerability increases sharply if roughness exists, particularly sharp machining marks. If aligned at right angles to tension stresses, such roughness is certain to be fatal to any highly stressed machine part. This is illustrated by the results of tests shown in Figure 5.

Laboratory specimens were loaded in a machine designed to produce bending stresses in the specially finished necked areas while the test

pieces rotated at high speeds. The fixed bending load during rotation of the specimen caused the part to be stressed alternately in tension and compression.

Figure 6 shows the results of bending fatigue tests, stress being plotted against the number of stress cycles. While these results are based upon well finished specimens, they illustrate the effects of various shapes upon the life of test pieces made of the same material. Taking two of the extreme conditions, it is seen that a change from the 9.85 inch radius to a specimen having square shoulders reduced the endurance limit from about 49,000 psi to approximately 24,000 psi.

These data show why sharp corners

in highly stressed pieces are avoided, and when abrupt section changes are so highly undesirable. Fatigue failure of a connecting rod part was caused by lack of a $1/64$ " radius on the edge in a dowel hole.

FINISH COMPARISONS

TESTS TO SHOW the effects of various types of surface finish have been conducted by several investigators, among them the University of Illinois, Engineering Experimental Station. In their tests, the results of which are shown in Figure 7, rotating beam fatigue test specimens with smooth turned, ground, and polished surfaces were compared.

In the particular material tested, the polished specimens had an endurance limit of slightly over 50,000 psi, and the smooth turned specimen had an endurance limit of about 41,000 psi. The effects of "accidental" scratches on well finished surfaces caused a life decrease much greater than the change from the polished to the turned condition.

For example, it has been found that scratches cut to a depth of .001 to .003 with sharp pointed tools will reduce the fatigue strength of soft steels by 30 per cent to 40 per cent. This effect is generally more pronounced in the harder steels. Where only one, or relatively few notches or scratches exist, pronounced stress concentrations occur adjacent to the defects, and peak stresses can be 2 to 3 times those obtained in the unmarred section. If the entire surface is covered with scratches or notches, as would be obtained in a smooth turn, the effect is to reduce the peak values of the stress concentrations.

RESULTS OF FATIGUE TESTS

THE PRACTICAL EFFECTS of these fatigue tests conducted with laboratory specimens is that: (1) highly stressed machine parts are well finished; (2) care is taken in avoiding abrupt section changes; and, (3) radii and fillets of generous proportions are specified wherever possible.

Effects of surface finish and section changes were demonstrated in two tests on a fork connecting rod. The crotch of this rod was polished in such a manner that the scratches were perpendicular to the axis of the big end bore and also at right angles to the stress axis. During a bench fatigue test, the rod was alternately stressed in tension and compression. Failure

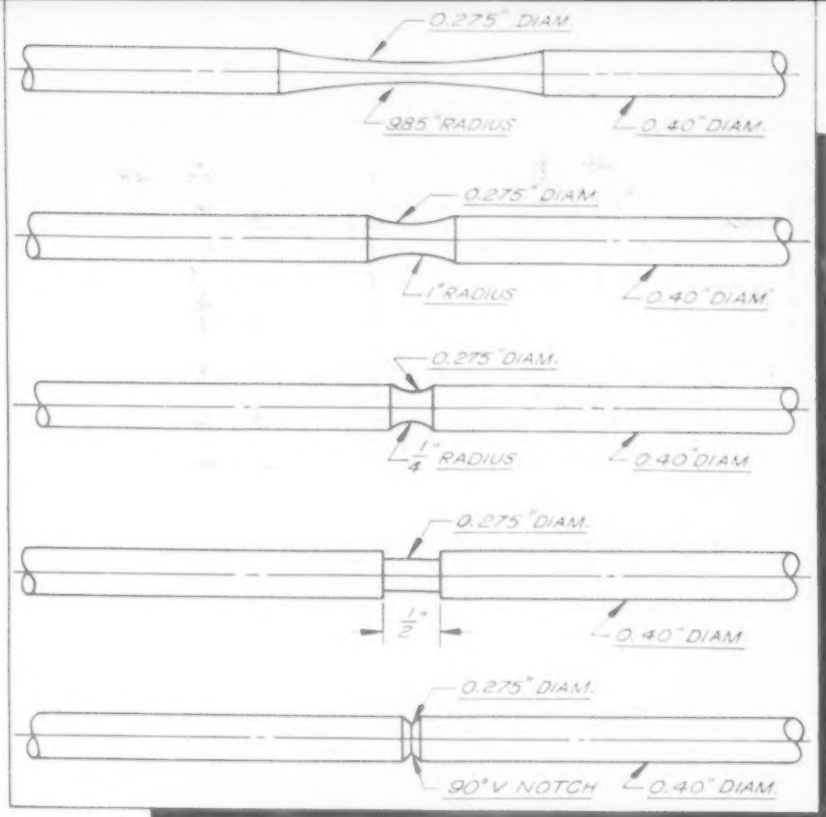


FIGURE 5. Specimens for study of effect of shape on endurance limit.

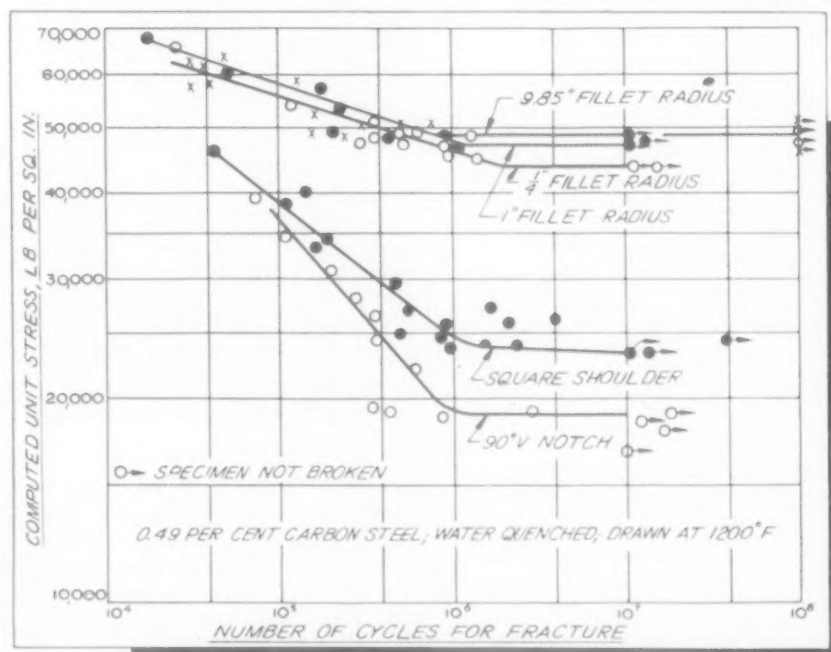
occurred along one of these scratches which was less than .0001 in depth. Changing the direction of polishing so that the scratches were at right angles to their original position resulted in a definite increase in the fatigue life.

Figure 8 illustrates the effect of a comparatively abrupt section change in the crotch of the rod. The result of the deviation from the specified true

radius was the cause of failure in about 1,750,000 stress cycles in a design that when properly manufactured would withstand 10,000,000 cycles under the same conditions without failure.

Continued requirements for higher engine ratings quite often resulted in fatigue failure of previously satisfactory designs. Tests with automotive parts prior to the war at the Re-

FIGURE 6. Results of bending fatigue tests on shapes shown in Figure 5.



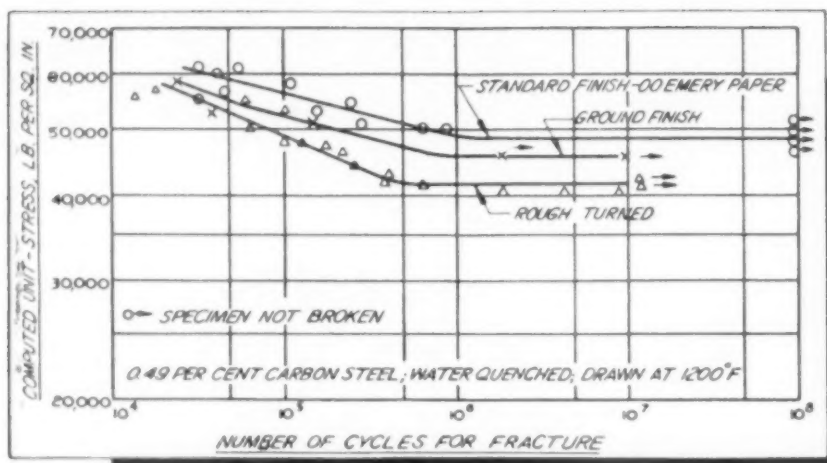


FIGURE 7. Results of fatigue tests on specimens with smooth turned, ground, and polished surfaces.

search Laboratories Division of General Motors Corporation proved that the life of various highly stressed parts could be greatly increased if the surfaces were pre-stressed by shot blasting with spherical steel shot.

By causing a thin layer at the surface to be placed in a state of compressive stress, that surface was rendered much less susceptible to fatigue failures which are always caused by tensile stress components. Properly shot blasted, the tensile stresses at the surfaces are reduced since the compression stress component is subtractive. While shot blasting does not do away with the necessity for completely finishing aircraft engine parts, it relieves a great deal of hand polishing.

The Allison Division, to our knowledge, became the first aircraft engine manufacturer to use shot blasting in production when this process was applied to the V-1710-C15 crankshaft in February, 1941. In the first stages of production expansion on the "C" type engine some comparatively short life crankshafts were found. Residual stresses caused by processing revisions were revealed by elaborate material and strain gage investigations. Shot blasting it was concluded, would reduce the spread in life of the crankshafts which torsional and bending fatigue tests showed to be high, although not abnormal.

Accelerated fatigue tests showed a 20 per cent gain in the endurance limit as a result of the application of shot blasting. This meant that the shafts could be subjected without failure to stresses 20 per cent greater than previously possible. The endurance limit of the polished crankshafts

without surface treatment was 75,000 psi (in bending fatigue), whereas the identical design had an endurance limit of 90,000 psi after being shot blasted.

Actual life increase is much greater than these figures seem to indicate. Assuming that both shafts would encounter periodic stresses of 80,000 psi., all the crankshafts without surface treatment would eventually fail. Shot blasted crankshafts, however, would have an infinite life.

A similar result was obtained with the fork and blade connecting rods. After strain gage investigations had led to the removal of undue stress concentrations by design changes, it was desired to increase the life of the rods still further without increasing



FIGURE 8.

Curvature variations in the crotch of connecting rod represent a deviation from true radius. Under test, failure resulted from 1,750,000 stress cycles. This part is designed so that proper manufacture will result in a part that will withstand 10,000,000 cycles.

the weight. After arriving at the definite control required, several fork connecting rods were shot blasted and were run on accelerated fatigue tests for comparison with the same design without the surface treatment.

To produce definite failures and to simulate over-boost and over-speed conditions, the tests were conducted at tension and compression loads 50 per cent greater than the equivalent gas and inertia values then in effect. Shot blasting again proved to be extremely beneficial for increasing the fatigue life, the average stress to failure being 750,000 psi. for the untreated rod, and 8,800,000 psi. for the shot blasted type.

Similar tests conducted on the blade connecting rod also showed the same order of life increase. Shot blasted connecting rods have been used by Allison in production engines since the late summer of 1941.

EFFECTS OF NITRIDING

SINCE laboratory tests showed that the nitriding process also produced compressive stresses at the surfaces of pieces so treated, and since the process resulted in surface hardness ideally suited for operation in plain bearings, investigations were started late in 1940 to determine the effects of nitriding upon the fatigue life of crankshafts.

Bending fatigue tests conducted on crankshafts of identical design and material showed that nitriding resulted in a life increase well beyond that obtained with shot blasting. Based upon the results of a great number of test shafts, the results were as follows:

	Endurance Limit
Polished Shafts — Not Shot Blasted	75,000 psi.
Polished Shafts — Shot Blasted	90,000 psi.
Nitrided Crankshafts — Reduced Polishing	120,000 psi.

Assuming that periodic stresses in the order of 100,000 psi. are encountered in service, the nitrided shaft would be the only design to come through without primary failure.

Nitrided crankshafts have been in production since the end of September, 1941, and to date no record exists of a single primary service failure even in severe combat conditions. Nitriding for increased life has been applied to other parts in the engine, and when properly developed has shown the same benefits as were obtained with the crankshafts.

THE END

THE TOOL ENGINEER

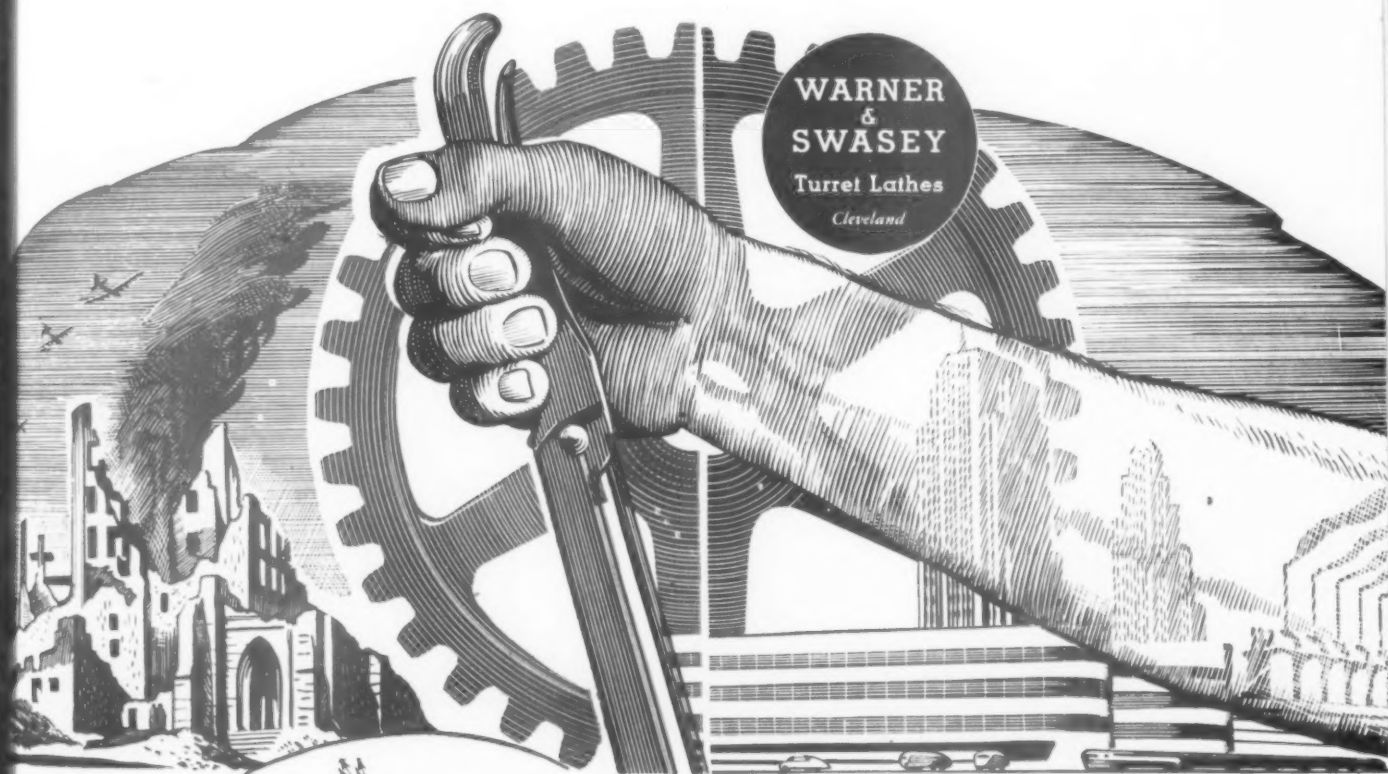
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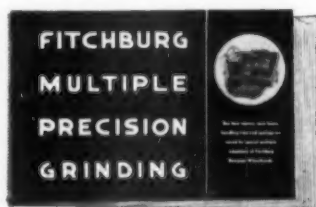
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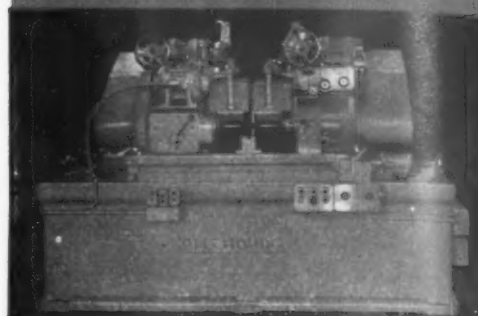
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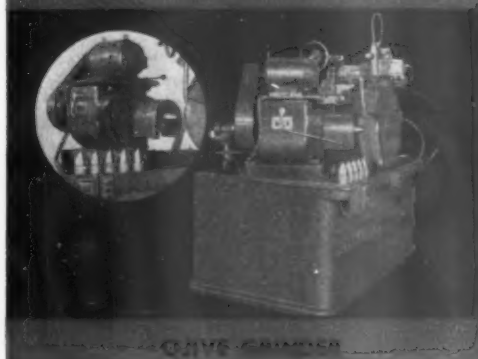
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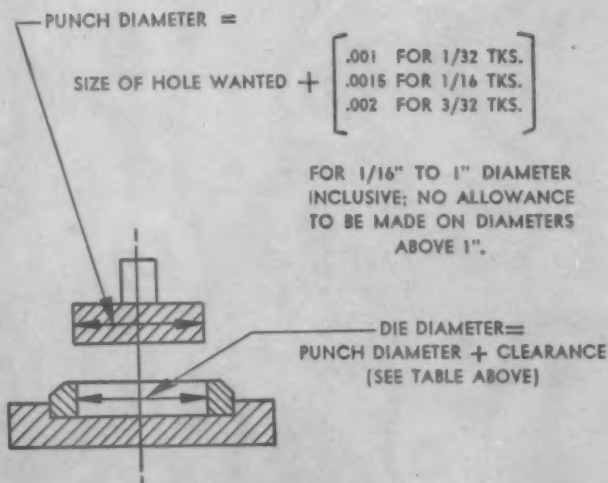
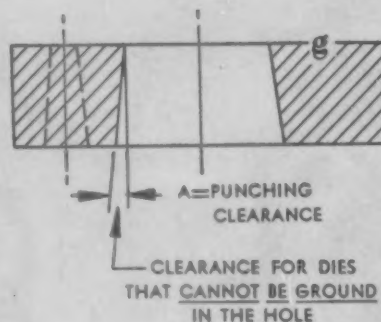
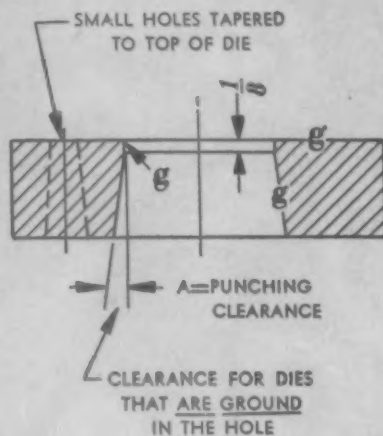
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SAVE WITH AUTOMATIC MULTIPLE PRECISION GRINDING

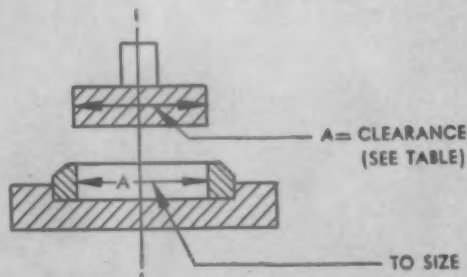
PRODUCTION DATA SHEET

CLEARANCE ALLOWANCES FOR PUNCHES AND DIES

THICKNESS OF MATERIAL	CLEARANCE ON DIAMETERS			A
	COPPER AND BRASS	SOFT & MED. STEEL, PHOS. BRONZE	HARD STEEL (SPRING ST.) SHEET TOOL STEEL	
.015	.001	.001	.001	1/4°
.020	.001	.001	.001	
.028	.001	.002	.002	
.032	.002	.002	.002	
.046	.002	.003	.003	
.0625	.003	.004	.005	
.079	.004	.005	.006	1/2°
.093	.005	.006	.007	
.109	.006	.007	.008	
.125	.007	.008	.009	
.155	.008	.009	.011	
.187	.009	.012	.013	
.250	.013	.016	.018	OVER 1/2°



**DESIGN FOR
CORRECT HOLE**



**DESIGN FOR
CORRECT BLANK**

Courtesy of Westinghouse Electric & Manufacturing Company

• Table and detailed drawings furnish information required to determine correct clearance allowances between punches and dies, according to the thickness and variety of material to be blanked.

Thicknesses of stock given in the table are commonly

used. To find the clearance for other thicknesses, divide the thickness of stock or material punched, by the constant 20 for brass, copper and soft steel; 16 for medium rolled steel; and 14 for hard steel. The constant for boiler plate exceeding .250" in thickness is 10.

NOTE: On this page is the twenty-sixth of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

THE CRIB

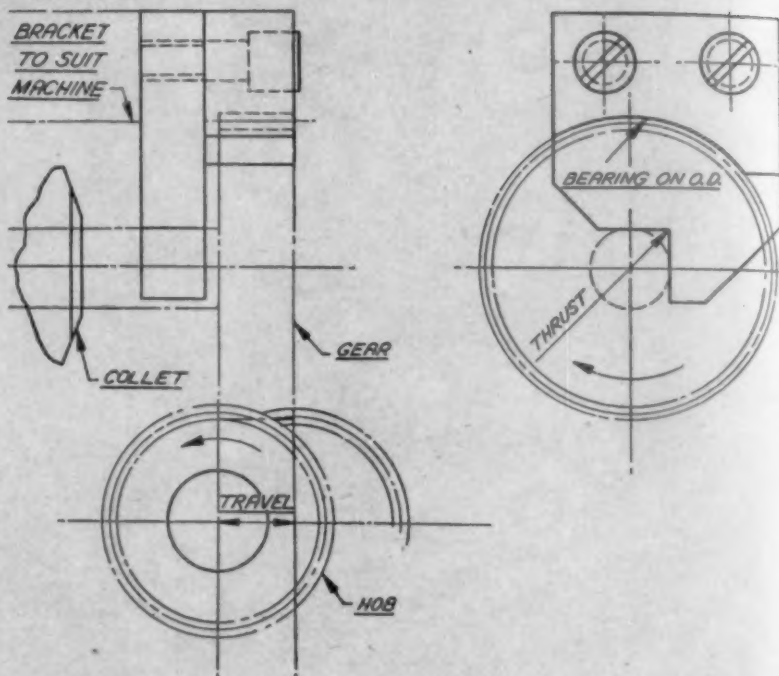
T. M. REG. U. S. PAT. OFF.

IDEAS • KINKS • SHORT CUTS

Steady Rest for Hobbing Small Stem Gears

Frequently, when hobbing small stem gears, required tool clearance does not permit chucking the gear stem deeply enough in the collet to assure a firm hold or to prevent springing. A steady rest bearing on the gear and gear stem above takes the upthrust of the cutting tool, without restricting cutting action or revolution of the workpiece.

As shown at the right, the steady rest is supported by a bracket above the work. Two bearing surfaces independently adjustable are furnished with respect to the work. One bears on the gear stem, the other on the teeth. These resist all upthrust imposed on the collet and the stem.



• Have you ever made notes on some of your "know-how" items — or perhaps drawn sketches on a paper napkin—only to throw or give them away?

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Simple Change Saves 2000 Man-hours per Year

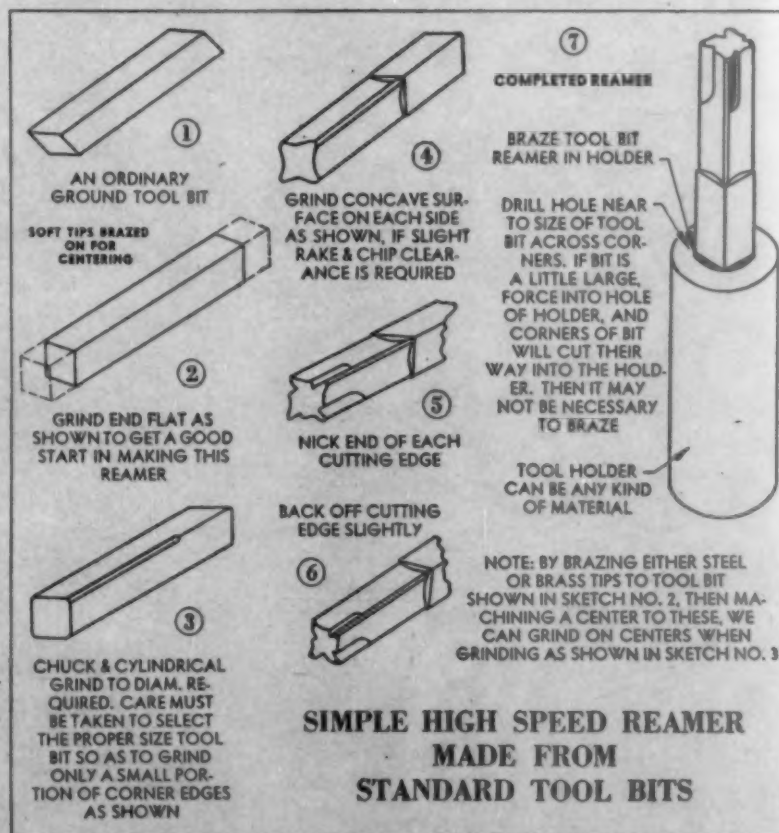
A turret lathe operator, running two Potter & Johnson machines, figured he had time to drill a $\frac{1}{4}$ " hole in the part while his lathes performed their work. He demonstrated how the stand on which a bench drill was mounted could be re-worked to permit movement from machine to machine.

The man was enabled to handle the extra operation, saving 2000 hours annually.

One Roughing Operation is Eliminated

A boring machine operator suggested omitting one roughing tool from a boring bar which had two roughing tools and one finishing tool.

Elimination of the tool resulted in a better bore and a saving of about 25 per cent in time.



Based on a drawing by Walter B. Pohle

INDUCTION HEATING

Mechanized Metal Treatment

Now used to braze, forge and heat treat important ordnance items, induction heating applications increase steadily. Hardening, normalizing and annealing techniques are prefaced here by analysis of basic principles and metallurgy involved in the induction process

● INTRODUCTION

INDUCTION HEATING for the treating of steel parts has been standard practice in many manufacturing plants for several years, resulting in tremendous economies.

Induction hardening equipment enables the user to surface harden only the requisite portion of almost any steel object and thus maintain the original ductility and strength; to harden articles of intricate design which cannot feasibly be treated in any other way; to eliminate usual expensive pretreatment such as copper plating and carburizing and costly subsequent straightening and cleaning operations; to cut material costs by having a wide selection of steels from which to choose; and to harden a fully machined item without the necessity of finishing operations; or by continued application of power to through-heat cross sections for forging or hardening.

It permits equipment design which warrants mechanization of the whole operation to fulfill production line demands with small space requirements and low operating costs.

Time cycles of a few seconds are maintained by automatic regulation of power and split-second heating and quenching intervals. These factors are indispensable to the creation of facsimile results to exacting specifications.

UNDERLYING PRINCIPLES

WHEN a material capable of conducting electric current is placed within a magnetic field set up by an inductor carrying an electric current, it becomes heated. Specifically chosen frequencies from 2,000 to 10,000 cycles and upward of 100,000 cycles are being used extensively at the present time.

The molecules within the steel attempt to align themselves with the polarity of the field and with this

DR. H. B. OSBORN, JR.

RESEARCH AND DEVELOPMENT ENGINEER
TOCCO DIVISION
THE OHIO CRANKSHAFT COMPANY

changing thousands of times per second an enormous amount of internal molecular friction is developed.

Because high frequency current concentrates on the surface of its conductor, the surface layers become heated first. Other things being equal, the higher the frequency, the shallower the depth of penetration.

OF MAJOR IMPORTANCE is the source of heat caused by eddy currents which result from magnetic flux changes and large currents much the same as eddies in a fast moving stream of water. With the resistance of the steel increasing with the temperature, the intensity of the eddy current decreases until it is only a fraction of its "cold" original value when the proper temperature is reached.

Original core properties can be maintained and surface hardness secured by quenching when complete carbide solution has been attained at desired depths. Continued application of power causes an increase in

depth of heating for, as each layer of steel is brought to temperature, the current density shifts to the layer beneath, which offers a lower resistance. Additional depth results from heat conduction with longer time of heating.

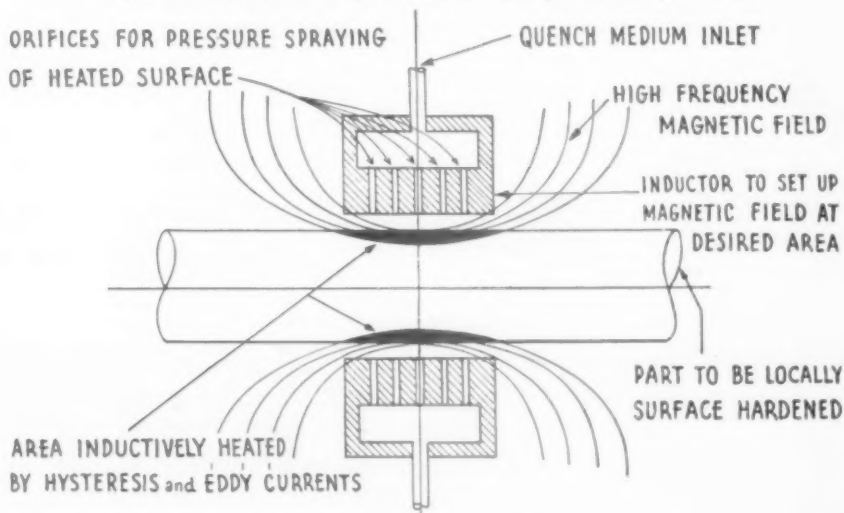
It is obvious that the selection of the proper frequency and the control of power and heating time will produce any desired specifications of surface hardening or through-heating for heat treating, annealing, normalizing, brazing or forging or forming.

There are certain relationships between frequency and diameter or thickness of stock treated upon which may depend the selection of the specific frequency to be used. However, approximately 95 per cent of all induction heating problems can be solved with 9,600 cycle equipment.

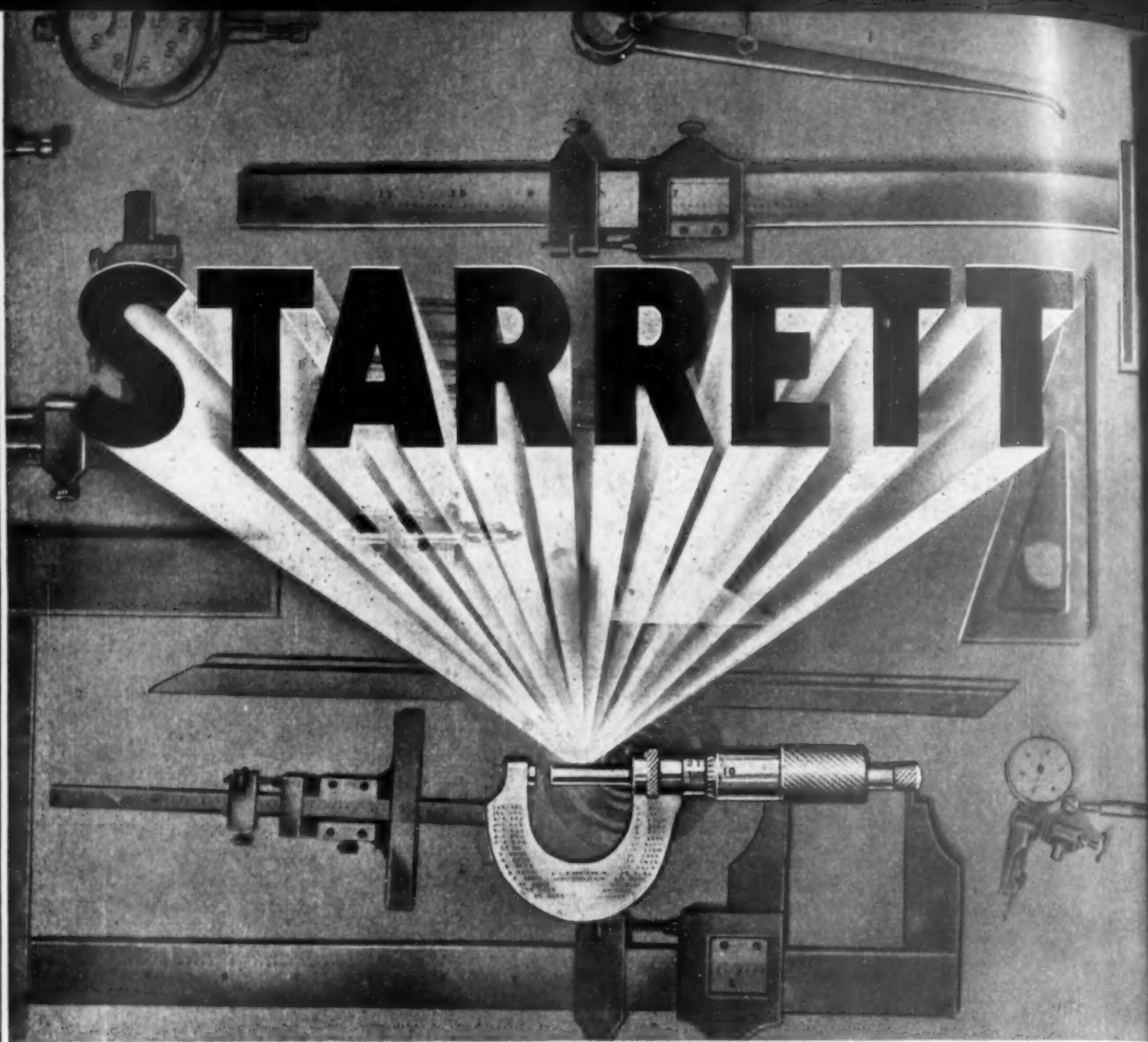
FOR EXAMPLE, $\frac{1}{2}$ " round bar of hardenable steel when heated by using a frequency of 2000 cycles will heat throughout its entire cross section quite rapidly and if quenched will not be surface hardened. Instead there is through-hardening of the bar with a decrease of hardness from sur-

(Continued on page 101)

Schematic diagram of inductor and bar being inductively heated.



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face to center. This same piece of steel could be readily heated to a depth of .100" with a frequency of 9600 cycles and to even shallower depths with frequencies above 100,000 cycles.

Frequencies above 100,000 cycles are needed for heating small diameter stock, with values up to several million cycles needed for very fine wire. Surface hardening is not considered practical for these small dimensions.

Although special inductors have been designed to heat thin strip stock with reasonably low frequency, the above data will be approximately correct for such items with thickness of plate being used in place of diameter.

Although not in complete agreement with the above illustrative data which involves frequencies obtainable from standard equipment, such a relationship as the following is substantially correct for steel, (magnetic at room temperature) heated to hardening temperatures, (i.e. above approximately 1450°F.):

$$F = 1.2 \frac{R}{r^2} \times 10^7$$

F=Optimum frequency in cycles per second

R=Resistivity in Ohm—centimeters (steel = 15×10^{-6})

r=Radius of bar or cylinder (in inches)

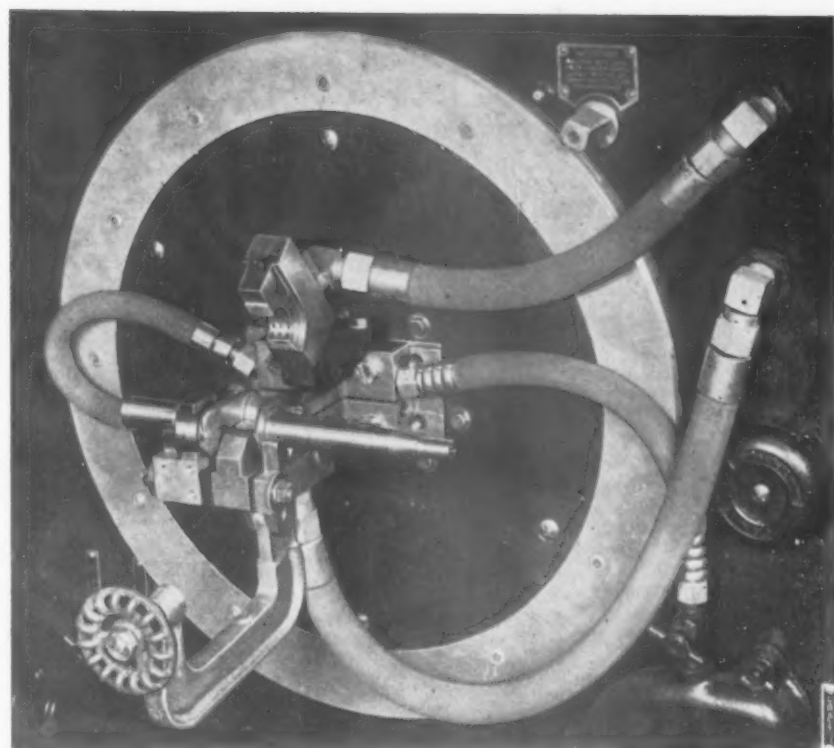
This equation expresses optimum minimum frequency for maximum rate of heating of surface layers heated by induction, but does not take into account the flow of heat by conduction to layers beneath. It bears no relationship to efficiency since it can be shown that, provided the steel will respond to the frequency, the conversion of kilowatts to B.T.U. energy in the steel, is essentially the same regardless of frequency, that is:

Temperature	Steel heated
2000° F	5 to 6¢ per kilowatt hour
1600° F	9 to 10¢ per kilowatt hour
1000° F	15 to 16¢ per kilowatt hour

METALLURGY OF THE INDUCTION PROCESS

ANY MATERIAL which will respond metallurgically to a heating and quenching treatment can be induction hardened successfully. No special requisites of analysis exist; however, there are certain other obvious requirements.

The carbon content must be suffi-



Ohio Crankshaft photos
Small split type inductor used for hardening small crankshaft. Note quench holes which supply spray quench at proper instant are an integral part of the inductor.

cient to produce the desired hardness, although higher hardness is obtained than with conventional methods.

A fine grain size is preferable, yet not always essential. Low carbon steels with a carburized case, medium and high carbon steels (both plain and alloy) and cast iron with a portion of the carbon in the combined form, may be used for this process.

Previously, many parts now induction hardened were made of high-alloy steels. The fact that these steels could be more readily machined in a heat treated condition and distorted less than carbon steels justified their use. However, since high physical properties of the core are not generally re-

quired, it has been possible to change to plain carbon steels, induction hardening only the surface for high wear resistance. These parts now are completely machined in the comparatively soft condition, then hardened at the last operation.

Since steel is heated for various purposes, the metallurgy involved in each application may be different. Hardening requires that the microstructure be converted to austenite by heating to temperatures above those specified for each analysis, which, when quenched at a rate equal to or in excess of the critical cooling rate, is converted to martensite. Subsequent heating whether by induction or other methods converts the martensite to temper-martensite at temperatures below 200°F, and sorbite at temperatures above 350°F. Because of the short heating time for induction hardening, temperatures are not critical and the time element of relatively little consequence. In order to bring sluggish structures into solution, temperatures of several hundred degrees above the critical often are used without coarsening effects which would occur if duplicated in a furnace.

Holding supercritical temperatures for long periods of time to bring about
(Continued on page 103)

Induction Hardening of Gears

● Important phases of Dr. Osborn's discussion of induction heating concerned the equipment involved and techniques used in induction hardening gears. Extensive coverage of these subjects in *The Tool Engineer* in October, 1942 and in April, 1943, caused the editors to delete this material in the interests of space conservation.

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AIR HARDENING

GSN SPECIAL
AIR HARDENING

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OIL HARDENING

FOR MAXIMUM PRODUCTION RUNS

TYPICAL ANALYSIS

	C	Si	Mn	Cr	V	Mo	Co
GSN							
Oil Hardening	2.20	.50	.50	13.20	—	—	—
GSN SPECIAL							
Air Hardening	1.50	.30	.30	11.50	.30	.70	—
COBALT CHROME							
Air Hardening	1.35	.50	.25	12.50	—	.70	3.00

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THE TOOL ENGINEER

carbide solution has long been in ill repute. Recent induction hardening data indicates that a time as short as 0.2 to 0.3 second is sufficient to bring about complete transformation to the austenitic condition dependent, of course, upon a satisfactory prior structure.

The structure typical of any induction hardened area has a characteristic appearance. The usual accicular martensitic structure resulting from furnace hardening is absent. Instead, we find a more homogeneous structure; a nodular type martensite of obvious greater fineness. Higher maximum hardnesses result when steel is heated inductively than when heated thermally. This hardness increment is around 2 to 3 points Rockwell "C" at approximately .40 to .50 carbon and 5 to 6 points at lower carbon contents.

SURFACE HARDENING

THE TRACK ASSEMBLY of army tanks depends to a large extent on induction hardening. Track pins are surface hardened to high surface hardness and uniform depth over the entire length of the cylindrical section leaving the end soft for peening over after insertion in the tank block.

Draw punches for cartridge cases from the .303 caliber up to and including 105 mm. are surface hardened in standard automatic fixtures which heat and quench progressively, following treatment for track pins and other shafts having long bearing areas. However, by control of feed, the hardness is also carried over the working end of the punch. A most unique method is employed for the surface hardening of the associated dies. These are heated externally in a standard inductor block to the correct hardening temperature. The heat is then discontinued and after a carefully controlled delay period, the inside diameter of the die is quenched through a nozzle already in position in the die. Thus, the I.D. is surface hardened to a uniform depth following the contour of the die, the delay period having permitted the balance of the die to fall below a hardening temperature since the outside will cool at a faster rate than the bore.

The usual procedure of putting bearing races on truck and automotive axle shafts by placing a heavy race on the portion of the shaft requiring a bearing surface is expensive.

The application of induction hardening the shaft at the desired areas and making the shaft act as its own bearing race and eliminates the need for the high alloy bearing steel.

Rocker armshafts which distort if conventionally treated are hardened in the rocker areas in equipment which automatically locates the bearing surface in the inductor, and after the heating and quenching cycle is completed, moves it to the next position. Both thin walled carburized tubes and heavier wall SAE 1045-50 parts are used. Production rates on single installations run to 5,000 treated areas per hour.

CONTRASTED to the small parts which are easily hardened on the smaller units is the problem of hardening bearing surfaces on a large diesel crankshaft. These are handled in a horizontal position in a tunnel line unit in which each bearing is hardened by means of split inductor type blocks.

Although not a surface hardening application, induction heating solved a serious problem brought about by the rubber shortage. Rubber covered parts returned to the manufacturer for recovering had formerly been placed in the furnace and the rubber burned from the surface. This wanton waste of rubber had to be stopped and now rubber-covered items are placed on a continuous conveyor which conducts them through high-frequency field set up within an inductor coil. The surface of the steel

is heated to a controlled temperature which destroys the bond between the steel and the rubber. The article, as it emerges from the inductor coil, is quickly freed of the rubber.

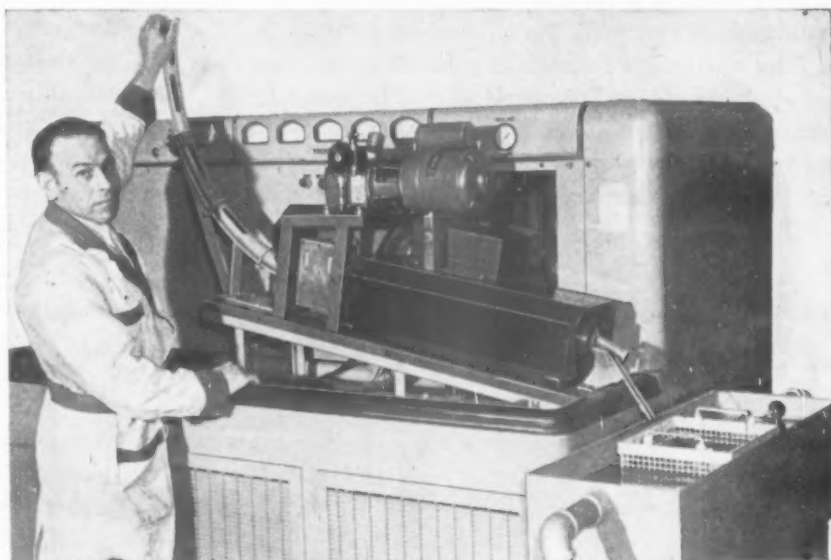
HEAT TREATING

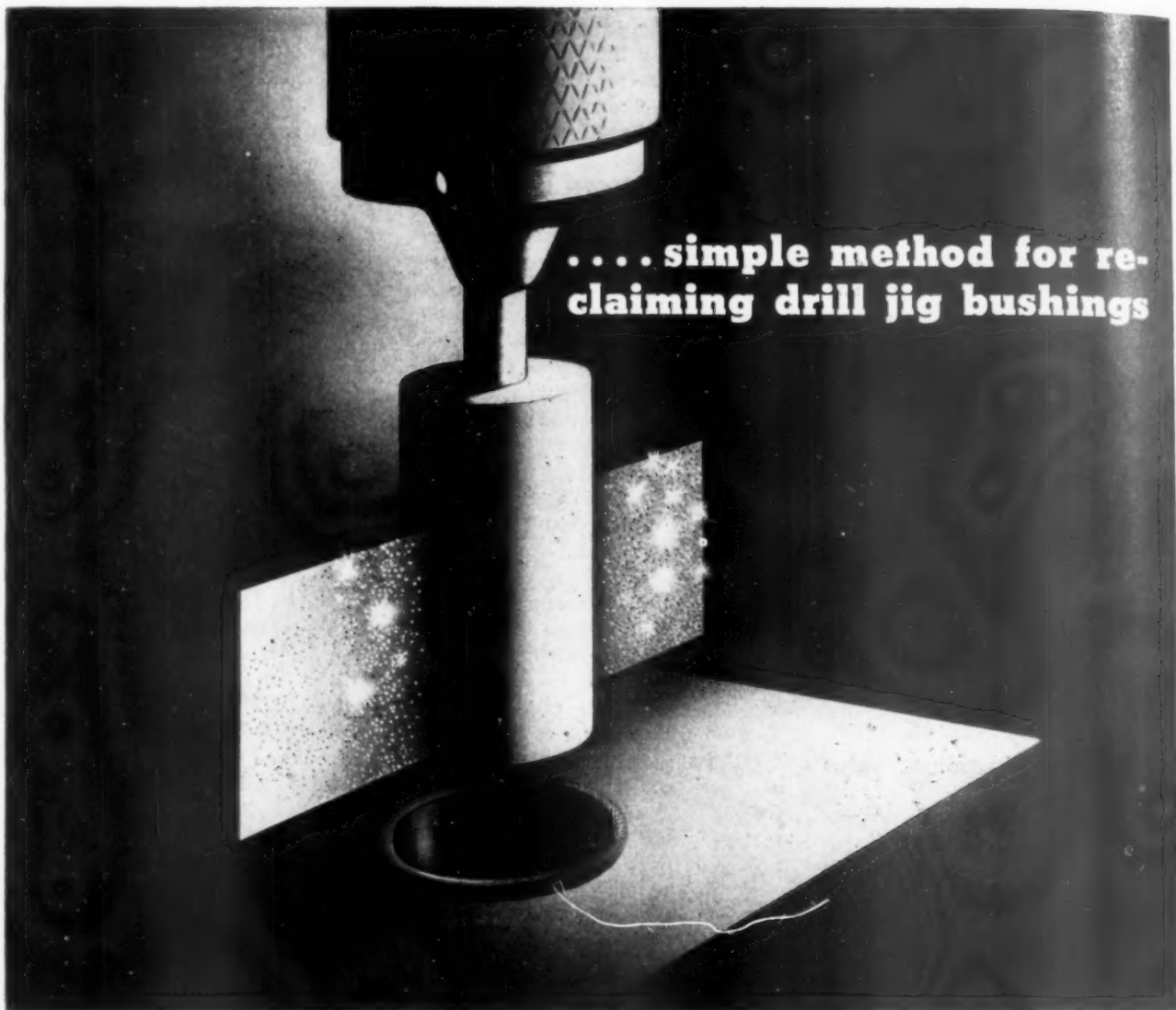
ONE of the greatest contributions of induction hardening to the war effort has been its ability to produce an armour piercing projectile of superior penetrating qualities. Specifications vary slightly between calibers, but in most cases the shot is hardened throughout the entire cross section and the base is heated in such a manner that the final shot has an extremely high nose hardness which decreases gradually toward the soft base. Some types of shot use a penetrating cap to which a metal windshield is fastened. These caps are treated to full hardness throughout with the exception of an accurately controlled length of the skirt which is left soft for crimping onto the shot.

Further development of techniques successfully used for the surface hardening of cylindrical stock produced a standard unit for the continuous through heat treatment of similar parts. A bar or a tube regardless of length, is passed through an inductor assembly having a specific power input and at controlled rates so that it is heated uniformly throughout to a hardening temperature. Its forward motion carries it into a quenching chamber from which it emerges in a fully hardened condition. Continuing,

(Continued on page 105)

Standard induction heating unit with fixture for hardening piston pins. Roller feed guides parts through inductor and then into quench. Production of 1"x3" pins is 3,600 per hour.





.....simple method for re-claiming drill jig bushings

Information furnished by an Industrial Publication

The interior surface of drill jig bushings can be injured in several ways: by galling, burning, or seizing of the drill. In one manufacturing plant a simple but very effective method has been developed for restoring the surface by honing.

The equipment consists of a mandrel and a piece of abrasive cloth. The mandrel can be made from scrap rounds or cut-offs. The body is turned down to a diameter slightly less than that of the bushing, and the shank machined to fit into a conventional drill chuck.

The body is slotted at the bottom to take a piece of abrasive cloth somewhat wider than the depth of the bushing. The cloth is wrapped around the mandrel and the assembly started in the hole before power is applied.

If a coolant or oil lubricant is used, the bushing can be "honed" by moving the mandrel up and down as it rotates. As the hole enlarges, or as the "gall" is removed, additional pieces of abrasive cloth can be caught under the original piece to enlarge the hole still further.

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it then passes through another inductor which, by control of power input, will reheat to any pre-selected drawing temperature, then to a quench manifold to cool for handling. The end product is clean, straight, and with a perfectly uniform sorbitic structure throughout its cross section, from one end of a length of stock to another and from one piece to the next. Further, a single bar can be treated at the same cost as one bar from a batch of hundreds which might have been run as a lot.

NORMALIZING AND ANNEALING

IN ADDITION to the heat treating, induction heating equipment finds extensive use for normalizing, annealing or drawing. Parts may be selectively heated to soften areas hardened by previous treatment such as the annealing of threading diameters on hard shafts. Cycles are set on many units which automatically reheat a part which has been fully hardened and draw it back to any desired hardness range. This same result is often achieved by using a short, accurately controlled quench, which leaves a sufficient amount of residual heat in a hardened part to draw itself back to a specified lower hardness.

Continuous heating of bar stock and tubing has found wide acceptance because of the inherent accuracy and control of temperature. Included will be annealing or normalizing of tubing in motion, copper brazing of formed tubing which is subsequently drawn down to requisite sizes and annealing of tubing, particularly stainless, between drawing operations which introduce cold work. Temperatures used depend upon the material. In the case of some stainless steels, these run over 2100°F.

Intricate welded assemblies are often times highly stressed. Induction coils are designed to concentrate heat in the weld and adjacent areas to remove these stresses.

BRAZING AND SOLDERING

PRIOR to the adaptation of induction heating, certain shells were made by piercing and forging of a billet, nosing the open end of the tube, machining to correct dimensions and heat treating to give the shell its needed physicals for fragmentation. A manufacturer needed forging furnaces, forges and heat treating furnaces which could not be delivered to plants needing such equipment in



Loading unit for hardening four bearings on crankshaft is adjustable for various designs of shafts.

time to allow early production. Instead, small manufacturers who had machine capacity were given contracts and provided with induction heating units which were readily available. The manufacturing process then consisted of using heat treated tubing and silver soldering adaptors into the nose and tail of the shell. Subsequent machining completed the part which still possessed the requisite physical properties since the induction process confined the heat needed for soldering.

The brazing of high speed tools to mild steel shanks, and carbide tips to cutting tools has aided immensely in speeding up production and saving critical materials.

FORGING AND FORMING

THERE ARE many advantages inherent with the use of induction heating for forging and forming operations. High production rates per unit, low operating costs, uniformity of temperature, lack of scale and accompanying increase in die life are

factors which commend the process.

The forming of the nose and tail ends of 100, 250, and 500 pound aerial bombs is completed after heating to temperatures as high as 2,400°F (depending upon method of forming). Heating times are reduced to 60/70 seconds.

Smaller tubes are heated for necking operations for gas cylinders and because of the accurate control of temperature, can be formed in one pass.

Certain units which heat slugs for upsetting machines are provided with automatic fixtures where the passage of the parts through the inductor is controlled by a plunger mechanism and a magazine feed run from the induction unit timer or mechanically tied in with the operating lever of the press. In either case, the entire operation requires only an operator for loading the magazine.

Aluminum propellers are heated for upsetting of flanges as are aluminum billets prior to extrusion.

THE END.

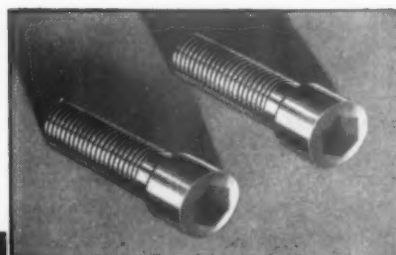
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MEN • MATERIALS • MACHINES

NEW METHODS FOR

Removing Chips from Machine Tools

In general, choice of the most efficient method of chip removal for a given application is dictated by problems imposed by the particular metal processed; whether the machines are operated singly or in groups; and by the quantity and character of the chips produced.

The method of disposal selected or developed should assure minimum machine stoppage and handling, minimum possibility of injury to machine bearing surfaces, and minimum losses in waste and spoilage of coolant oils.

Studies based on these considerations at one General Electric plant led to the development of a number of interesting and practical methods of chip removal for various applications.

Chips are washed away from the hobbers in 200-inch gear hobbing machines with the coolant oil on these big units. A close-up view (Figure 1) on these pages shows the hobber in motion with the coolant oil washing the chips from the gear tire (A) as it is cut by the rotating hob (B) into it an inclined trough (C). The oil and chips flow into a metal basket.

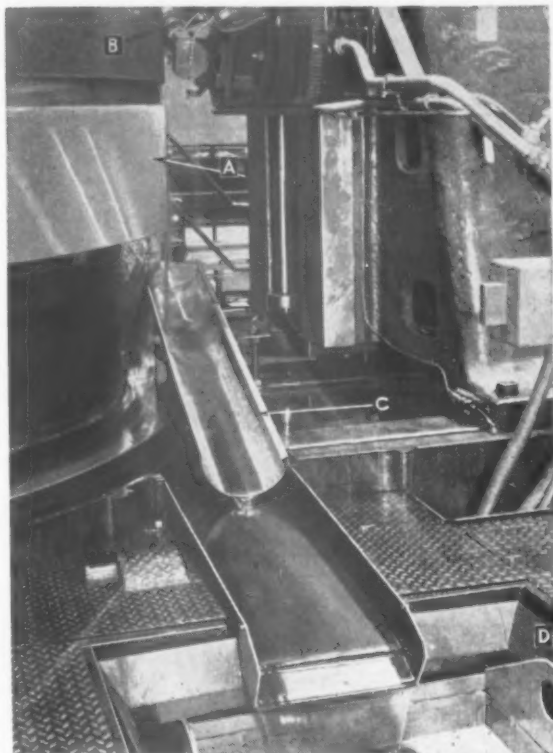
The chip basket is constructed of fine wire mesh which allows the oil to filter into a sump pit. The chip basket is lifted from the pit by a crane and placed on a drip pan to allow the oil to drain from the chips more thoroughly before the basket is picked up by a fork truck and transported to a side car.

This method of chip removal has eliminated the necessity of stopping the machine to remove chips, lessened

P. A. SANBORN
GENERAL ELECTRIC COMPANY

200-inch gear hobbing machines

Chips are washed from these big units by the coolant oil, dropping into an inclined trough from which they flow into a basket.



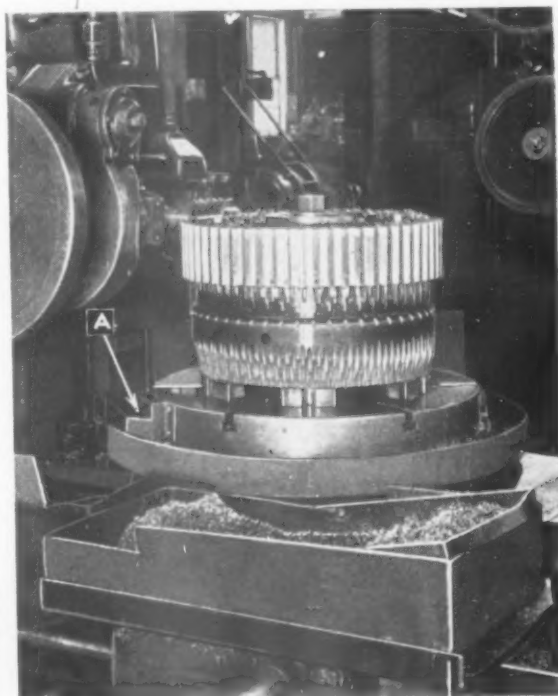
the possibility of break-down, and reduced the amount of oil lost through waste or spoilage.

Automatic screw machines in the plant are equipped with conveyor belts to remove the large number of

chips falling from the cutter heads. The work pieces are diverted from the chips through chutes placed directly under the cut-off position, while the hot chips are directed to the conveyor by steel aprons which are bolted to

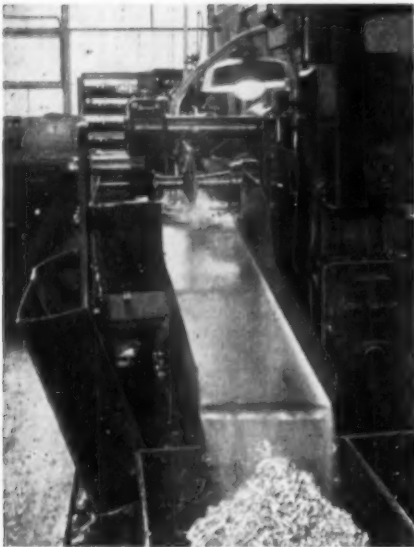
Removal from vertical hobber

A wiper or paddle (A in photograph) is attached to the side of the machine table. Chips are swept into a perforated box through which the coolant drains.



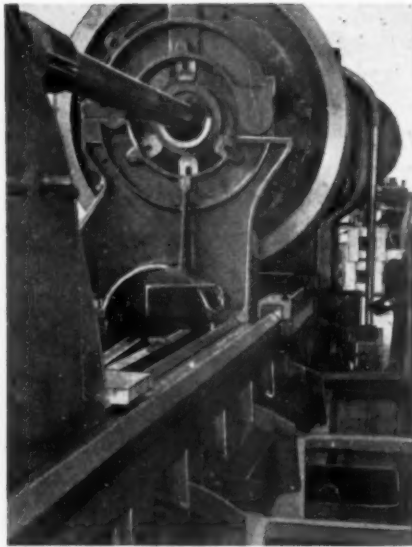
General Electric photos

Efficient chip removal speeds many machining operations. Here are new and widely adaptable disposal methods for large and small machines



Disposal from milling machine

As chips leave the cutter they are washed by the coolant into a trough which carries them into a perforated scrap box. The oil is recirculated.



Method developed for turning lathes

To rid large turning lathes of chips, the top of the foundation is inclined so falling metal slides out the side into boxes in the scrap pit.

brackets located on the conveyor frame.

The conveyor consists of an 18-inch flexible woven wire belt carried between two detachable chains on angle iron guides. The conveyor is driven by a 1-4-horsepower motor through a speed reducer. It travels at a speed of 35 feet per minute horizontally through tunnels in the base of machine, then inclines upward to deliver chips over the end of the base into a centrifugal separator bucket. The filled bucket is transported directly to a centrifugal separator.

Steel wire brushes located under

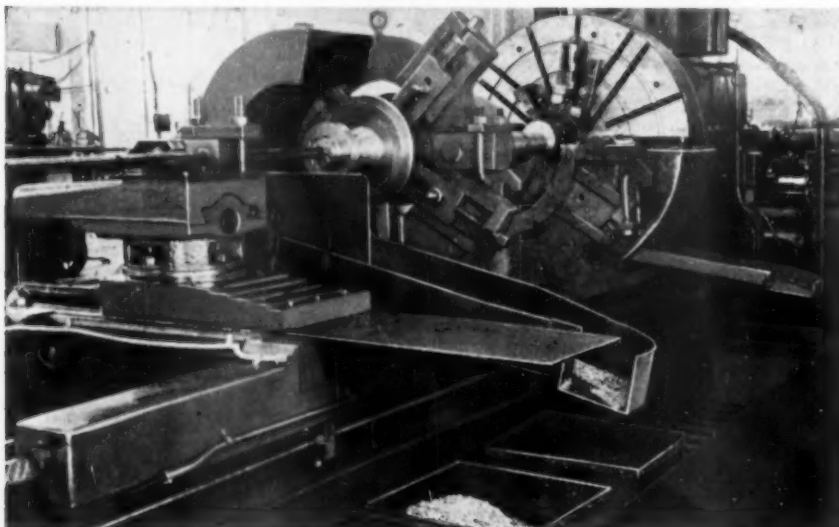
the head sprocket prevent chips from being carried back into base. The drive is so arranged that the conveyor can be started or stopped with the machine or independently.

Because there is a tendency for chips to pile up rapidly on vertical hobbing machines, continuous removal of chips is necessary. To accomplish this, a wiper or paddle (A in Figure 2) is attached to the side of the machine table. A circular pan with a small opening is positioned beneath the table.

With each revolution of the table, the paddle sweeps the oil and

Solution for deep-hole boring lathes

A stream of oil flows through the boring bar, washing chips onto an inclined trough and into perforated boxes on a roller conveyor to facilitate removal.



chips through a small opening in the pan. They fall into a steel chip box with a perforated bottom which permits the oil to be drained and returned to the machine. When filled, the chip box can be removed without interfering with the operation of the machine.

COOLANT WASHES CHIPS AWAY

Chip removal from straddle milling machines is accomplished by directing a stream of coolant against the chips as they leave the cutter. The stream has sufficient force to wash the chips into a trough which carries them into the scrap removal box (Figure 3) which is perforated to allow the coolant to drain into a sump for recirculation.

This method of chip removal was dictated largely by the extreme flakiness of the chips. Moreover, use of the coolant improves the machining operation. Without it, chips build up about the cutter causing heat concentration in the work.

Where many large shafts, pinions and gears are being turned, it is necessary to rid the machine of the chips as quickly as possible to keep the scrap from piling up.

This has been accomplished on large turning lathes by having the top of the foundation on an incline so that chips falling onto it slide out the side into boxes in the scrap pit (Figure 4).

The boxes are removed from the pit by crane and dumped into a scrap car. The advantage of this method is the fact that the removal of chips from the machine proper is by gravity. Since there is no conveyor equipment involved, there is no maintenance involved in the method.

CONVEYOR FOR CHIP BOX REMOVAL

The method developed by G. E. for removing chips from deep hole drilling lathes is provocative (Figure 5).

A steady stream of oil flows through the boring bar washing the chips into an inclined trough. The oil and chips are discharged into chip boxes with perforated bottoms and sides which allow the oil to drain into a drip trough located below the roller conveyor. The drip trough is inclined to allow the oil to flow into a sump pit located at the far end of the machine.

The roller conveyor makes it possible to remove the filled chip box quickly from the discharge point and substitute an empty container.

THE END.

THE TOOL ENGINEER

Throw a needle through a Haystack?

this pipe testing machine
Oilgear Fluid Power answered
difficult design problems.



Oilgear Fluid Power has solved more difficult problems

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. . . or any one of dozens of Oilgear answers to problems that appear virtually impossible—*until you know Oilgear Fluid Power.*

For a quarter century Oilgear engineers have worked with executives and designers of hundreds of companies building machines and mechanisms of widely diversified use. The combination of Oilgear experience and know-how with the remarkable possibilities inherent in Oilgear Fluid Power equipment may be the very answer to *your* long-sought perfected machine. *Now* is the time to find out. The Oilgear Company, 1308 W. Bruce Street, Milwaukee, Wisconsin.

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5. Apply accurately variable pressure either static or in motion?
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11. Obtain automatic torque control?
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14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

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MACHINE TOOLS

... news and trends in the
Machine Tool Industry ...

INDUSTRY OUTLOOK

• Shipments decline; backlog is cut another 14 per cent

Total volume of machine tool shipments continued its steady decline in September as the industry's output dropped another 3.2 per cent from the August figure.

September volume totaled \$85,842,000, down \$1,563,000 from the August total of \$87,405,000, according to industry-wide figures compiled by the Tools Division of the War Production Board.

Despite the continued decline in monthly shipments, the industry is biting deeper and deeper into its backlog. At its present pace, many a builder soon will be faced with the enigma empty order books and ample production facilities—unless they swing faster into direct and sub-contracting work on end items for the military.

Four months backlog is considered the danger point by the industry, and the backlog has been hanging at that figure throughout the summer and fall. Anything below four months backlog means that builders face trouble keeping their war-expanded facilities in operation.

Good news from the standpoint of war industries in need of machine tools, but bad news for the industry, was the fact that unfilled orders at the end of September totalled \$333,119,000, a decrease of about 14 per cent from the total at the end of August.

Proof that WPB hatchet welding is again bearing fruit was the Tools Division report that the net addition of orders in September—the difference between total orders and cancellations—were \$31,759,000. This was a drop of five per cent below August, but still considerably above the July figure of \$28,713,000.

Thus, at the current rate of shipments, and if new orders and cancellations continue to follow present trends, the industry will clear its order books in approximately four months.

Counteracting the assumption that machine tool shops will be flat by spring is news from eastern and middle western plants that the industry is beginning to sink its teeth deeper into direct war work. The day may not be far off, many signs indicate, when the volume of such direct war work exceeds the volume of machine tool production turned out by the machine tool industry.

POST-WAR IMPLICATIONS

• International and Detrola plan financial merger

International Machine Tool Corporation has made news in a manner that may be common for machine tool builders before the war is over.

A proposal to merge Detrola Corporation, radio and electronics equipment manufacturer, into the machine

tool concern under the name of the International Detrola Corporation as a step in launching the latter into a diversified field of post-war industry was announced by the two boards in letters to stockholders last month.

Strengthening of International's bid for post-war activity and the enlistment of its larger capital for Detrola's peacetime program of making radio equipment were listed by C. Russell Feldman, president of both concerns, as principal objectives of the merger.

Both companies are engaged in war production. Detrola's plant in Detroit employs some 1,250 persons on military radio and other service items exclusively. Pre-war products included portable and home radios, record changers and automobile radios.

International has a 41-year history in machine tool making. It has machine tool plants in Elkhart and Indianapolis, Indiana, which employ more than 1,350 persons. It has a commercial welding division at South Bend, Indiana.

Products of International include heavy duty and full automatic turret lathes and superfinishing machines. In addition, the corporation is now engaged in direct production of military automotive units.

Design and building of machine tools will continue to be a major project of

the merged companies, and the organization expects after release from wartime obligations to resume its domestic and export business in this field, International says.

NEW PRODUCTS

• Sheffield builds sales fences; announces expansion of line

Builders, who have been taking orders faster than they could turn out machines, are beginning to survey possible peacetime markets, build and repair their sales department fences.

Such is the implication in news from The Sheffield Corporation. Last month the Dayton, Ohio, concern announced a rapid expansion of its activities in the development and production of certain types of machine tools, such as the optical form grinder, precision thread grinder, chamfering, and other machine tools.

World famous as a precision manufacturer, the company's machines, gages and measuring instruments have established it as a leader in its field.

Looking toward the post-war market scramble, a conference of Sheffield dealers and representatives was held in Dayton recently to view the concern's "new and improved products."

Paul Polk, vice president in charge of field engineering and distributions, said that "in addition to explanations of the machines, there were discussions covering markets and how these products have many applications in war work, as well as for peacetime use."

Dealers in 14 strategically located cities, he said, now are handling Sheffield products and are prepared to render any service customers may require.



JOHN E. ANDRESS
Barnes Drill

"... there is still hope for fair activity on a normal hour basis ..."

• For the interest of TOOL ENGINEER magazine readers, who are buyers and users of machine tools, leaders of the machine tool industry have been invited to present their views on possible post-war trends of the industry.



CONVERTING TO PEACE-TIME PRODUCTION

• Winning of the war must first come, then the keenly competitive race to meet the pent-up demands for all kinds of commodities.

Manufacturers of these goods, including household appliances, automobiles, farm implements, etc. must equip with highly specialized new and up-to-the-minute designs of Machine Tools.

Used, secondhand and war plant abused machine tools will not suffice nor cut costs.

The research and engineering developments in machine tool designs, even during war times, will obsolesce extant models of production equipment.

Live, aggressive manufacturers, to survive, prosper and maintain leadership for their products, must find "better ways of doing things" by tooling up with the very latest and often specially designed machines for mass, efficient and economical output.

In spite of the unprecedented machine tool production during the last three years in the War Victory effort, there is hope still for fair activity on a normal hour basis for those machine tool builders with new and better products.

All this contemplates return to free enterprise, reasonable taxation and elimination of government regimentation.


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DECEMBER, 1943



CAPITAL COMMUNIQUE

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T. N. SANDIFER

Special dispatch from THE TOOL ENGINEER'S Correspondent in the nation's capital.

WASHINGTON

The formal War Production Board order looking to a redistribution of available and surplus cutting tools, mentioned here some time ago, is well advanced toward the stage where some action may be anticipated.

It has been in the hands of a so-called "task committee" comprising 3 members of the cutting tool industry and one distributor, and has been discussed in much detail at various meetings between using services, industry, government procurement officials and others. While described as still in nebulous form, a number of features that probably will be incorporated in any final order are now recognizable.

There will be some procedure set down for locating surplus or other available cutting tools, in the industry, in using plants, and among Federal agencies. There will be some definition of what comes under the heading of "surplus" tools.

The individual shop's "housekeeping" methods come into consideration on this point. It is recognized that in some plants, nothing is ever surplus under the conditions prevailing in such plants. Shop management, in other words, is a vital factor.

RETURN TO MANUFACTURER?

Also entering into consideration must be the length of time a tool has been in use, in determining if obsolescent or surplus. Standard and so-called "special" tools will be treated separately. This recognizes that many special items are a blueprint proposition. On the other hand, recognizable standard tools are tangible, and can be handled accordingly.

Present thinking on their disposition is that they should be channeled back to the manufacturer, within certain classifications, and from there passed into essential use again. In other words, it is felt that the best channel for redistributing any tools found available is at the manufacturer level.

RUSSIA IN THE PICTURE?

The proposition boils down to answering the questions (1) how to locate available cutting tools, probably through some form of compulsory reporting; (2) how to determine if a tool is still being put to the best use where it is, or whether it should be called in and re-issued somewhere else; and (3) the proper and most efficient manner of getting these tools back into use.

On the broader subject of disposal of surplus after the war, or of anticipating a let-down that might catch industry over-loaded, some interesting sidelights are pertinent here.

Some plan is believed here to be shaping for re-equipping devastated industries found in Russia by WPB Chairman Donald Nelson on his recent trip. He said nothing publicly, but his comments indicated that he was greatly struck with the probable need of Russian industry to call on this country for such rehabilitation, maybe soon.

It can be said, however, that published stories on the subject have been entirely speculative. Under existing arrangements shipments of various goods have been going to Russia, but at this writing, food has been put ahead of machine tools.

In the event of any special machines being called for, either as a result of recent American visits, or otherwise, there is an emergency "bank" of such equipment that can be drawn against, it is understood.

\$75,000,000,000 IN GOODS

American production plants undoubtedly are going to have some competition abroad after the war, from plants using American tools. One reason is that certain places abroad have obtained large shipments of American tools of all descriptions, especially articles they never had in their own countries, except where imported from us prior to the war; the tools were sent in the expectation that vast new war industries would be launched to bolster our war resources.

Actually, in some such countries, the war factories will never be in production for this war, at the present outlook. But the countries will have the tools.

The answer, in some observers' expectations, is that we in America will have better tools by that time. Also, word here tends to offset the fear that industry is going to be overburdened with long-life machine tools left from the war.

In Federally-sponsored or built, de-

fense plants, according to some information, maintenance is the biggest factor in the operations. This reflects the fact that many new workers are handling such tools, and the result is that their normal useful period is being materially cut down. This angle has been commented on by tool men themselves, but more and more it is being accepted here.

However, the end of the war will find the Government with about 75 billion dollars of goods—plants and machinery—that must be handled. Plants seeking to get back into normal production in many cases will have to get extra equipment out of the way first. The size of this emergency load is indicated by the fact that in 1940, the estimated total production in this country was 76 billion dollars.

URGE REVISION OF TOOL NAMES

The thinking here is toward a gradual, rather than an abrupt break-up of war industry. Where a number of shops are making the same product, some way is being sought by which it can be decided which company will continue on its war work and which will be released for civilian consumer production.

Tool nomenclature is badly in need of simplifying, in the opinion of various sources here. The multiplicity of names for tools doing the same work, or the variety of tools for the same general purpose has called for comment in both Army and Navy.

One officer, Brigadier General E. E. MacMorland has advanced a suggestion, before a local chapter of the American Society of Tool Engineers, for a Federal system of stock numbers based on the principle that if several tools do the same job, they should be considered to be the same tool and be numbered the same.

WHEN IS A WRENCH NOT A WRENCH?

"The most urgent need behind the front line is the correction of non-standard nomenclature and numbering many tools we use," he said.

He cited the four-way wrench. It is known variously as "wrench, 4-way; wrench, rim nut; wrench, wheel nut; cross-rim wrench, and rim wrench."

The Navy experience with the problem has had added complications from abroad. Not only do we use various names for tools doing similar work, it appears, but the British, French, and other Navies have their own terms. Since almost 20 percent of all overhaul (Concluded on page 114)



FROM THE WASHINGTON VIEWPOINT . . .

• WPB is working on a plan for redistribution of available and surplus cutting tools. Because they don't know how to locate such tools, the plan remain nebulous.

• Growing here is the belief that industry will not be overburdened with long-life machine tools. Administrators on the Potomac like the stories drifting in from the hinterlands that unskilled workers are cutting the useful life of machines.

• The machine tool industry's plea for easier renegotiation to assure reserves for conversion to peacetime production is beginning to be considered seriously.



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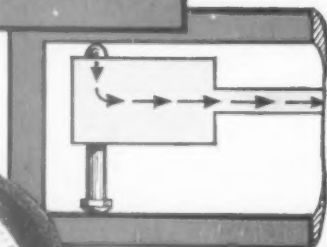
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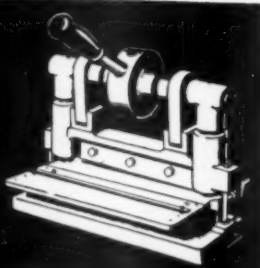
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Di-Acro Bender bends angle, channel, rod, tubing, wire, moulding, strip stock, etc. Capacity — Bender No. 1 — 1½", round cold rolled steel bar. Bender No. 2 — 1½" cold rolled steel bar.

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Di-Acro Brake forms non-stock angles, channels or "Vees". Right or left hand operation. Folding width — Brake No. 1 — 6". Brake No. 2 — 12". Brake No. 3 — 18".

SHEARS

(Illustrated)
Di-Acro Shear squares and sizes material, cuts strips, makes slits or notches, trims duplicated stampings. Shearing width — Shear No. 1 — 6". Shear No. 2 — 9". Shear No. 3 — 12".

O'NEIL-IRWIN **DI-ACRO** MFG. CO.

367 8th Avenue So.,
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—CAPITAL COMMUNIQUE—

(Continued from page 112)

and repair work in American navy yards has been done on foreign warships. American workmen had to extend their vocabularies.

These are a few samples of foreign terms for most commonly-used articles. Names of more complicated equipment can best be imagined. In the case of the Navy, the force at one East Coast yard went from 1,500, in 1937, to nearly 30,000 in this year, and many previously unskilled men, and even women, have been included in the expanded forces. With some of these, it is admitted, it was just as easy for them to learn a new name for some tool as an old one, never having had experience with it under either name.

But this is the point of the services argument; with so many new workers in industry and in service, a simpler name basis for tools would add to efficiency.

TO CHECK ON OVER-ORDERS

Marked improvement in chaser production can be attained by the first of the year if sufficient manpower can be obtained to operate all available facilities, is the opinion of some members of the industry who have conferred with WPB. Reports at the meeting recently of the advisory committee for the Chaser and Collapsible Tap industry indicated that some improvement had taken place recently.

Meanwhile, beginning this month, the industry is expected to put their schedules and orders under close check, with a view to bringing requirements into line. Possible over-ordering by customers some time back may prove to be a source of trouble that can be eliminated, or reduced.

The first step in checking this situation may be a letter from manufacturers to all purchasers of any large number of chasers, to determine whether such customers did over-order. This is in line with a suggestion made at the meeting. Other steps recommended were that backlogs of orders be reviewed, especially orders placed some months ago which are still undelivered.

In many instances, it is reported that customers have ordered eight to ten months ago, but despite not receiving delivery, have not followed up on their orders. The possible interpretation of this seeming indifference, it is believed, is that some of these customers over-ordered. It has been recommended to the industry that they cancel all chaser orders if these are not currently needed.

RENEGOTIATION IN THE PICTURE

All of the public comments here lately on termination of war contracts show that Washington is aware of the fact that post-war jobs will hinge on the speed with which factories can go into civilian production, which involves in many cases, re-tooling, or re-designing equipment.

So-called renegotiation of contracts, and questions of how much is to be paid, and how soon, to a company on completion of its war work, are being viewed by the more practical officials here as simply a matter of insuring that companies have the money for such re-tooling or re-equipment of their plants, where necessary to provide jobs. Machine tool men have stressed this in their talks.

THE END

THE TOOL ENGINEER

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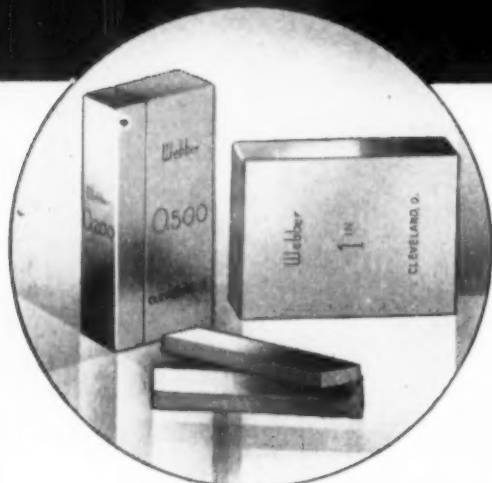
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INDUSTRIAL NEWS DIGEST

... a review of significant developments and new techniques
in mass production industries ...

1944 METAL CONGRESS

- Cleveland selected as site of next Congress and Exposition

CLEVELAND — This city's big Public Auditorium will play host to the 1944 National Metal Congress and Exposition, trustees of the American Society for Metals have announced.

The annual fall conclave of representatives of the metal working industry is scheduled to be held in the lake-side city, October 16-20. Facilities of the Auditorium, the Society states, will readily accommodate exhibit installations of any type or size.

FOUNDRY SHOW TO BUFFALO

- Foundrymen's Association meeting and show in April

CHICAGO — Executives and engineers in America's foundry industry will meet in Buffalo, N. Y., next April 25-28 for the Third War Production Foundry Congress, seeking answers to wartime problems of control, production and quality.

This 48th annual meeting of the American Foundrymen's Association, the organization has announced, will be held in conjunction with a Foundry Show of materials, equipment and supplies for foundry use.

Both the Congress and Show will be held in Buffalo's Memorial Auditorium. Described by the Association as a "stripped for action" Foundry Show, exhibits will emphasize products and services having definite wartime value to the industry. While the unlimited type of operating exhibit will be missing, many new developments and product applications that have grown out of the nation's war production experience will be shown.

In keeping with wartime considerations, the elaborate type of display will be restricted to minimize expense to exhibitors and conserve transportation and storage space.

Separate programs will deal with each of the cast metals, it is planned. Several meeting symposia are planned, one on malleable iron, specializing in heading and grating, and one for steel men covering shop practices, melting practice, heat treatment and sand control. A third symposium of current interest scheduled is that on centrifugal casting developments.

The Annual Foundation Lecture of the Association initiated in 1943, will be presented by Dr. H. W. Gillett, chief technical advisor Battelle Me-

morial Institute, Columbus, Ohio. Dr. Gillett has chosen "Cupola Raw Materials" as his subject.

Of prime interest to every foundry executive, the Association believes, will be discussions on postwar problems of the foundry industry.

WELDING LOOKS AHEAD

- Mechanical Engineers hear post-war predictions on welding

NEW YORK—Advances in arc welding have been so phenomenal in the past three years that this fabricating process may well revolutionize many aspects of post-war production, J. R. Morrill, assistant to the vice president, Lincoln Electric Company, told a meeting of the Metropolitan Section, American Society of Mechanical Engineers.

"In the world of tomorrow it is not difficult to conceive of new petroleum fuels for power or even atomic power made available and harnessed by arc welded pressure vessels," he said.

"The present arc welded magnesium flying wing indicates possibilities for new methods of transportation," Morrill told the Mechanical Engineers.

(Continued on page 120)

Novel Jig Serves Two Purposes



Bramson Staff photo

One jig serves flame cutting requirements and solves materials handling problem in shell casing production.

A midwestern plant, converted from peacetime manufacture of stoves, killed two birds with one stone on production of the shell or casing for 500-pound bombs. As the red hot casing leaves the nose forming operation, its traveling position on the conveyer must be reversed to cut a hole in the nose for the detonation cap.

Both operations are performed through the application of a square trunnion fixture, which is an integral part of the conveyer. Rollers on top and bottom of the cage-like fixture permit entrance of the casing and exit after 180° turn.

The complete turn, however, is intercepted at 10° from perpendicular, and a flame cutting head is lowered over the nose for cutting the hole. The 180° rotation is then completed, and the conveyer takes the casing.

"GREENIE"

T.M. REG. U.S. PAT. OFF.

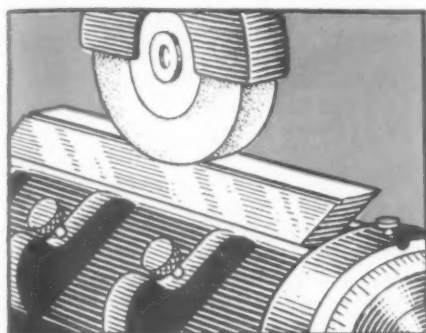
"A Ham What Am ..."



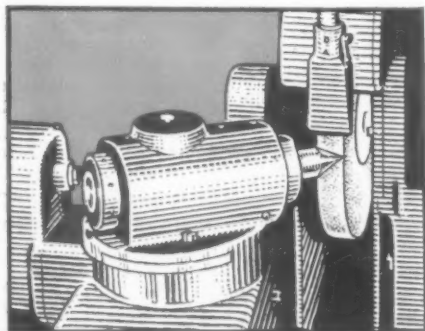
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HOW TO *Recondition*

GRINDING MACHINE CENTERS AND BLADES



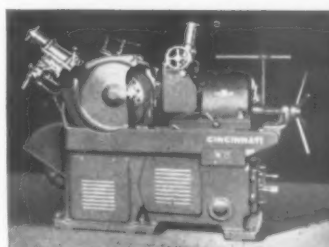
Blades—Sintered carbide and high speed steel blades have remarkable wearing qualities and must be ground carefully because they are very resistant to grinding wheels. During regrinding the wheel becomes dull quickly, and dull wheels check the blade. With the proper precautions, however, a blade can be reground to its original accuracy. Use the correct wheel for blade material; take light cuts (.0005" for h. s. s. and .0002" for the carbides); dress the wheel often; when grinding blades on a surface grinder, flood with coolant. If you use a cutter grinder, be sure to grind dry.



Centers — Worn centers can readily be reground to their original accuracy. High speed steel and tool steel center points may be reground on a plain center-type grinder with the aid of a center grinding fixture; on a universal grinder, with the headstock. Use a soft wheel, (grade M2 Aluminum Oxide, 60 to 80 grain) even though it means changing the wheel already on the machine. Be sure to flood with coolant, *before* the center contacts the wheel. Sintered carbide centers may be reground on a cutter grinder using wheels recommended for the type of material. In either case, take very light cuts (.0002"). Run the center at a high speed. These precautions will prevent "checking" and give your centers many more productive hours.

Some machine elements do no cutting but, nevertheless, are used up in the manufacturing process and must be classed as "consumable." Centers for center-type grinders and blades for centerless grinders are members of this group. Many of them are made of high speed steel or sintered carbide, both critical materials, and their conservation is just as important as milling cutters, hobs, form tools, etc.

It's not difficult to grind blades and centers. Follow the few fundamental principles outlined at the left, and your blades and centers will be good for a much greater volume of production.



CINCINNATI No. 2 Centerless Grinding Machine. Complete engineering specifications may be obtained by writing for catalog No. G-456-1.



CINCINNATI 12" Hydraulic Universal Grinding Machine. Complete engineering specifications may be obtained by writing for catalog No. G-486-1.

CINCINNATI GRINDERS INCORPORATED CINCINNATI, OHIO, U.S.A.

CENTERTYPE GRINDING MACHINES... CENTERLESS GRINDING MACHINES... CENTERLESS LAPPING MACHINES

(Continued from page 118)

"Arc welding has grown from a simple repair tool to where few products or structures made of metal are without welds in one form or another—from all welded ships weighing thousands of tons to clusters of aircraft tubing of material 25-1,000-inch in thickness.

"In the words of a prominent fabricator," he continued, "welding gives four industrial freedoms: Freedom from excess weight, freedom from structural weakness, freedom for design improvement, and freedom to use new materials where they are best suited."

In spite of its wartime importance, arc welding still is being used very little in some industries, Morrill said. "In the machinery field, for example, welding is being employed in only about one per cent of its possible applications. Tradition is being gradually overcome and its future use is practically unlimited."

"In the structural field," he continued, "welding is just coming into its own. In fact it is reliably estimated that only about one-quarter of the industrial applications which could employ welding are now using it. This means the welding industry is practically an infant in its present stage of development."

INDUSTRIAL SAFETY

- Help promised mass production industry on safety problems

CHICAGO — Reorganization of the activities of the National Safety Council's industrial safety engineering division recently has been accomplished to provide more practical and specific assistance with accident and health problems in mass production industry.

The new plan which is in line with the general reorganization of the Council's program, makes full use of the industrial membership sections as centers for the accumulation and distribution of all safety information in their respective fields.

Each safety engineer on the staff has been appointed as staff contact man for one or more of the industrial sections. He has been assigned in accordance with his experience and knowledge of the industries represented in the sections, according to Walter S. Paine, Council vice president on industrial safety.

As contact man the engineer is expected to work with the various subcommittees of the sectional executive committees on all sectional problems.

DETROIT ASSIGNMENT

- Westinghouse names Weaver Ordnance Plant chief

EAST PITTSBURGH—Appointment of James R. Weaver as manager of the Naval Ordnance Plant at Center Line, near Detroit, has been announced by Westinghouse Electric and Manufacturing Company which now operates the big plant.

Rear Admiral W. H. Blandy, chief of the Bureau of Ordnance, recently announced without explanation that operation of the Navy's \$60,000,000 plant was being transferred to Westinghouse from the Hudson Motor Car Company. The motor city plant becomes the third ordnance unit operated for the Navy by Westinghouse, the



Westinghouse photo

To James R. Weaver, longtime Westinghouse production executive, goes one of the toughest assignments in Detroit, management of the Navy's huge Centerline Ordnance Plant on the edge of the motor city.

others being at Canton, Ohio, and Louisville, Kentucky.

According to F. D. Newbury, Westinghouse vice president, the company hopes to continue the employment of all personnel, and full consideration will be accorded existing rights and privileges.

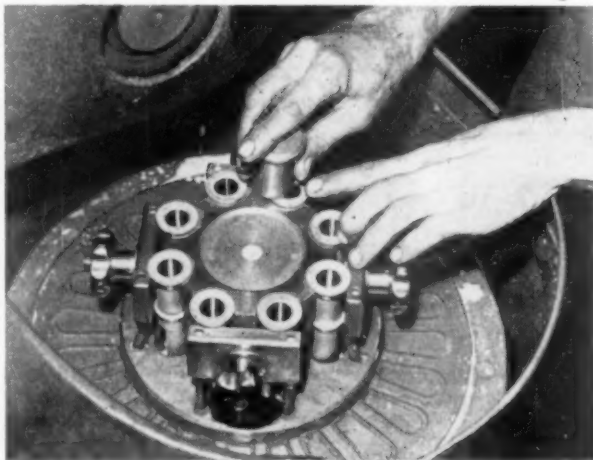
Weaver was transferred from Louisville where he had been manager since November, 1940. His successor as manager of the Louisville operation is C. E. Shiple, formerly superintendent.

Former president of the American Society of Tool Engineers, Weaver has been associated with Westinghouse since he served his apprenticeship as a machinist and then became a tool designer for the company in 1915.

Before going to Louisville, he was director of equipment, inspection and tests for the concern.

NEW FIXTURE

Fixture designed by Republic Aircraft Products for grinding eight tappet guides formerly ground one at a time.



AVCO photo

DETROIT—Tappet guide heads formerly ground one at a time are now ground in sets of eight with the help of an unusual new fixture developed by the Republic Aircraft Products Division of The Aviation Corporation.

The new fixture is octagonal in shape and mounts the tapped guides in pairs. Each pair is held in position by a clamp operating from a hand screw. The upper edge of the fixture is beveled to fit closely under the head of the tappet guides,

exposing them to the grinding wheel.

The fixture, positioned on the magnetic table of a rotary grinder, is made of ordinary tool steel and was built in the company's tool room.

So successful has been the fixture during its three months of operation that Republic engineers are working on an improved model which will handle 12 tappet guides at one operation with the same speed.

MATERIALS

NEW TEXT BOOK

- Ford Motor looks to post-war with new plastics school

DEARBORN, MICH. — Indicating growing interest in plastics as a post-war manufacturing technique, the study of plastics has proved one of the most popular subjects offered by the Ford Motor Company's Aircraft School.

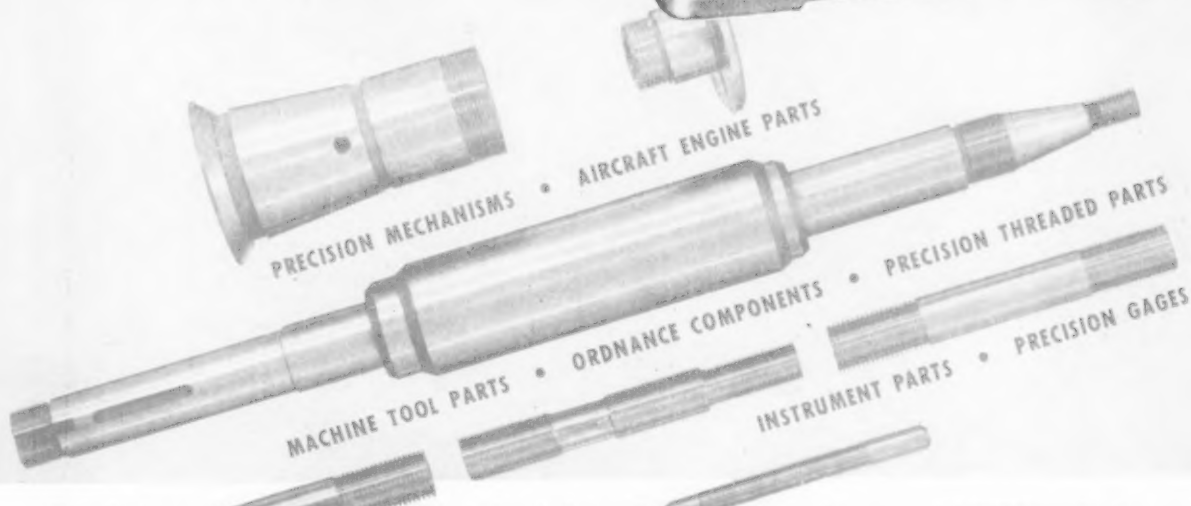
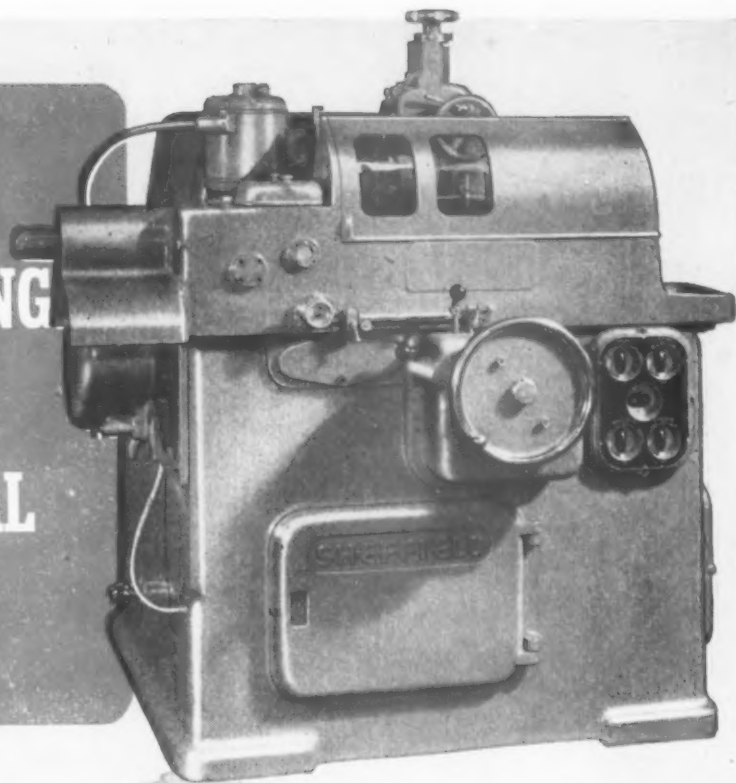
It is believed significant that the course was instituted by the Rouge's plant school's metallurgy department, under the sponsorship of Joe Coulter. Its development and expansion, however, is credited largely to Clifton Fellows, also of the metallurgy department, but well known in the plastics industry.

Since the course was opened last February, a total of 1,270 students have enrolled. The aircraft school, located in the company's aircraft engine building, divides its year into 10-week terms. Beginning and advanced plastic classes are in progress simultaneously.

Students without sufficient background are taught general chemistry before studying the chemistry of plastics, which provides a basic knowledge.

(Continued on page 123)

NEW THREAD-GRINDING ECONOMY ON COMMERCIAL PRODUCTION



Greatly increased production of thread grinding which produces a far more accurate and precise thread of superior finish than possible with other methods, may be achieved with Sheffield Precision Thread Grinders. These are the first American designed machines on which either the multi-ribbed or single-ribbed wheel may be used.

The finished thread may be formed in one plunge cut with the multi-ribbed wheel—high production of high quality. Multiple threads are ground in one pass without necessity for precision indexing.

Fine threads can be ground AFTER hardening, especially on thin-walled components, eliminating objectionable stresses and possibility of distortion—also assures thread being held concentric with other ground diameters and threaded sections of work part.

Substantial savings in operating time over conventional machines make it more economical to grind threads with a Sheffield Thread Grinder. Also because of these savings, it is now feasible to grind threads formerly produced by other methods.

WRITE FOR FULL DETAILS • BULLETIN M-100-143



THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

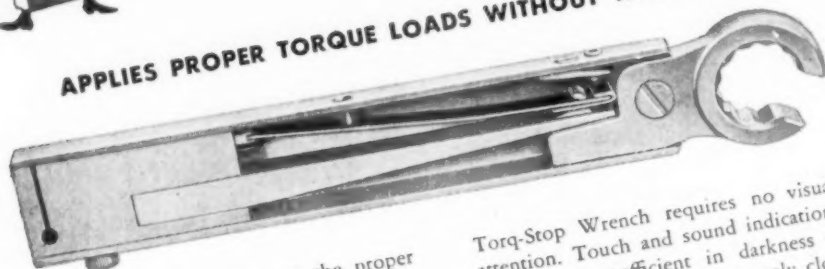
MACHINE TOOLS—GAGES—MEASURING INSTRUMENTS—CONTRACT SERVICES





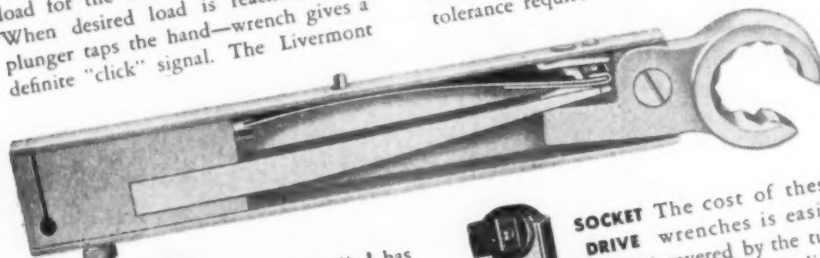
"TALKING" TORQUE WRENCH

APPLIES PROPER TORQUE LOADS WITHOUT WATCHING



Each wrench is pre-set to the proper load for the nut it is designed to fit. When desired load is reached, small plunger taps the hand—wrench gives a definite "click" signal. The Livermont

Torq-Stop Wrench requires no visual attention. Touch and sound indications make it super-efficient in darkness or in noisy areas — meets extremely close tolerance requirements.



HOSE CLAMP HEAD



Torque applied has almost no variation regardless of where the handle is held. Load curve is steady and constant, dropping away slightly when "click" occurs. No jar or jerk to cause injury to the flare of the tubing, or operator's hand.



SOCKET DRIVE SECTION The cost of these wrenches is easily covered by the tubing saved in eliminating waste due to "under" or "over" torquing. Time is saved as the worker is relieved from making a decision as to when the required torque is reached.



LIVERMONT *torq-stop* WRENCH

Sold by **TUBING SEAL-CAP, INCORPORATED**

215 West 7th St., Los Angeles 14, Calif. • Eastern Representative: 428 New Center Bldg., Detroit

(Continued from page 120)

edge of the fundamental processes involved in manufacturing plastic materials. The remainder of the course is divided into study of types of plastics and study of fabrication methods.

Enrollees have indicated a wide variety of reasons for their interest. To discover these reasons, the instructors include as a project the planning of a manufacturing plant to produce some article.

Few of the plans turned in by students are beyond the range of possibility. A typical example submitted was a plan for manufacturing pre-fabricated plastic houses.

In their search for an aid in teaching this subject the instructors report they failed to find a single textbook combining both the theory and practical phases of plastics. They say they solved the problem by compiling a textbook of their own.

Wartime shortages of materials, and equipment restrict the school's laboratory work in plastics. However, students gain some experience through molding small plastic medallions and other articles.

For these cast articles, it is first necessary for the students to prepare molds which they fill themselves with liquid plastic materials. Experiments are conducted with scrap materials and equipment already in the metallurgical laboratory of the Aircraft School.

The students are taught that the physical properties which a plastic has depend on the type of filler, resin and other materials used in its manufacture, and that its composition should be determined after a careful consideration of its intended use.

Instructors point out that there are many plastic articles on the market today which are proving satisfactory because the manufacturer carefully selected basic materials to give the product certain necessary properties.

In describing the growing use of plastics, the Ford textbook carries a prophetic message for production men, "The general public is well aware of the fact that the age of synthetic plastics is at hand. Thus the utilitarian value of the plastics industry is exceedingly great, especially when the properties and characteristics are investigated. It is necessary to consider that the correct technique of application and design must be used intelligently and profitably."

TEACHING KNOW-HOW

- Plastic mold and die techniques taught in Detroit school

DETROIT—Founded to acquaint the motor capital's tool and die industry with existing and potential possibilities of fabrication from plastics, the Delano Institute of Plastics here is now providing technical training in this new field for engineers, tool and die designers and journeymen tool and diemakers.

Believing that the future of plastics is assured and that Detroit can become the nation's center for this new industry, prominent engineers in the auto industry familiar with plastics are lending active support to the school's program.

(Continued on following page)



PRODUCTION PIX

WHAT'S DOING IN THE WORLD OF MASS MANUFACTURING



Mass production of transport airplanes on a scale never before projected has been undertaken by Curtiss-Wright Corporation in its four plants in Buffalo, St. Louis, and Louisville, and in a new factory of the Higgins Aircraft, Inc., New Orleans. The plane built is the giant Curtiss Commando, shown here on Buffalo plant assembly lines.



Col. J. J. Llewellyn, British Cabinet member and Supply Council director, Washington (right, above), inspecting Rolls-Royce engine production in Detroit with Packard Motor's Vice President W. M. Packer.

Fifty-two holes are drilled in turbo-supercharger casings in one operation on this multiple-spindle drill at General Electric's new Fort Wayne, Indiana, Works. The plant is completely conveyORIZED.



Precision-built 1,200 horsepower Pratt & Whitney radial aircraft engines for bombers on the assembly floor of General Motors' Buick Motor Division.

Mass production of the engines is accelerating in the auto builder's Flint, Michigan, and Melrose Park, Illinois, plants where fourth quarter output is scheduled to jump 36 per cent.



ACTUAL PHOTOGRAPH
Speed Treat Steel (.45 carbon) 1-inch cold drawn bar tied in a knot, cold, without fracture.

SPEED TREAT STEEL

A MEDIUM HIGH CARBON OPEN HEARTH PRODUCT

ONE STEEL *that gives you*

- 1 Excellent machinability
- 2 Greatly extended tool life
- 3 Good finished parts
- 4 High physical properties
- 5 Excellent impact resistance
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Buy War Bonds

SPEED TREAT STEEL

Remarkable strength plus fast machinability. Tensile 110,000 lbs., machines at 170 S.F.P.M. yet can be tied in a knot, cold. Ductile, clean cutting—saves tool life.

Licensor

MONARCH STEEL COMPANY

HAMMOND • INDIANAPOLIS • CHICAGO

PECKOVER'S LTD., Toronto, Canadian Distributor

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THE FITZSIMONS COMPANY

YOUNGSTOWN, OHIO

MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

INDUSTRIAL NEWS DIGEST

(Continued from preceding page)

Because the use of plastics cannot increase substantially unless knowledge of plastics tooling and die design is disseminated, these men are serving as technical instructors in the one-year-old school. In two 20-week evening courses, general and advanced, practical problems in mold design, selection of materials and actual fabrication are studied.

"Lack of technical knowledge of plastic mold design," one Detroit engineer said, "is retarding the growth of the plastics industry. Since technical books do not provide adequate data on the subject of mold design and construction, we are endeavoring to spread this knowledge throughout the motor industry."

Enrollment in the school is not restricted to Detroit residents.

PRESSED METALS

- Institute moves to Cleveland to facilitate research

CLEVELAND—to facilitate service to its members and expedite the work of a research committee being organized, the Pressed Metals Institute has moved its headquarters here from New York. The new office is at 829 Union Commerce Building.

W. W. Galbreath, president, Alliance Porcelain Products Company, Alliance, Ohio, has been appointed executive vice president of the organization.

The research division of the institute, Galbreath said, will be concerned chiefly in studying opportunities for pressed metal in post-war manufacture. Plastics, glass, sintered metals, resin bonded plywood and paper, and new alloys will be studied by the institute committee for possible use in peacetime consumer production.

INDUSTRIAL BUSINESS NOTES

INDUSTRY REPORTS

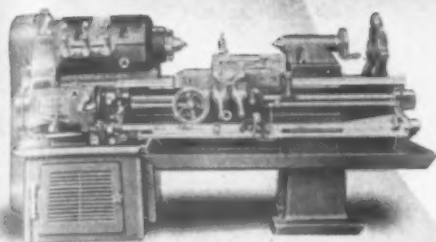
- News of expansions, purchases and new services

Pratt & Whitney expands: Clayton R. Burt, president, Niles-Bement-Pond Company, West Hartford, has announced that his 83-year-old company has acquired the Chandler-Evans, Corporation, South Meriden, Conn.

The new subsidiary plants at South Meriden, Wallingford and Dayton, Ohio, will continue under the same management with Charles W. Deeds as president. Chandler-Evans build and market aircraft engine accessories under the trade name "CECO". The company now is engaged in filling substantial Government orders.

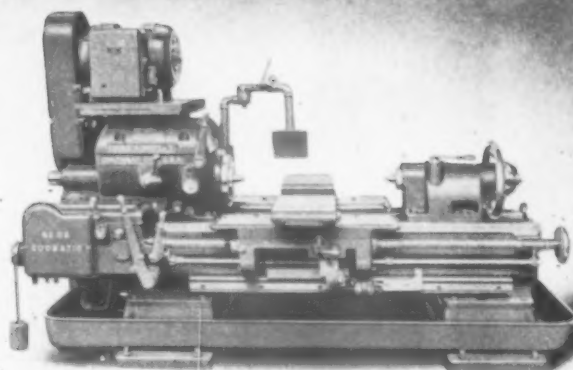
The acquisition has post-war implications, as revealed by Mr. Burt. This not only speeds things up, but also is in line with our company's farsighted policy in connection with post-war development. Aviation unquestionably is destined to play a major part in the future of our country and the entire world. We would be backward if we failed to apply the well known Pratt & Whitney ability for precision workmanship to those things the American

(Continued on page 127)



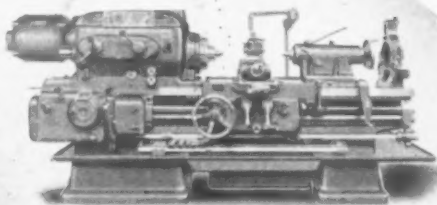
14" & 16" TOOL ROOM LATHES

A new high in accuracy and dependable operation—easy of control, yet unusually sturdy in construction, give a maximum work output.



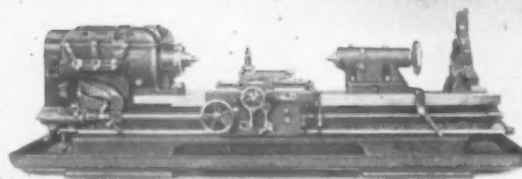
No. 3-A DUOMATIC

Outstanding in the field of automatic equipment. Set-ups and cycles are changed so quickly that it is a profit maker in both the small and the large production shops.



18" MANUFACTURING LATHE

A vital tool for both the small and large shop. Efficient on single piece work and a time saver on duplicate piece jobs not suitable for an automatic. A profitable tool



25" ENGINE LATHE

Powerful for the tough jobs, with liberal dimensions. You will find this lathe an outstanding performer.

PROFITABLE MODERN TOOLS for Tool Room and Manufacturing

A LINE of modern lathes, backed by experience in design and manufacture since 1892. Whether for the tool room or for manufacturing—shops throughout the world have found them to be dependable profit makers.

Write for detailed descriptive literature



February 23, 1943

August 23, 1942

March 6, 1942

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.

ENGINE

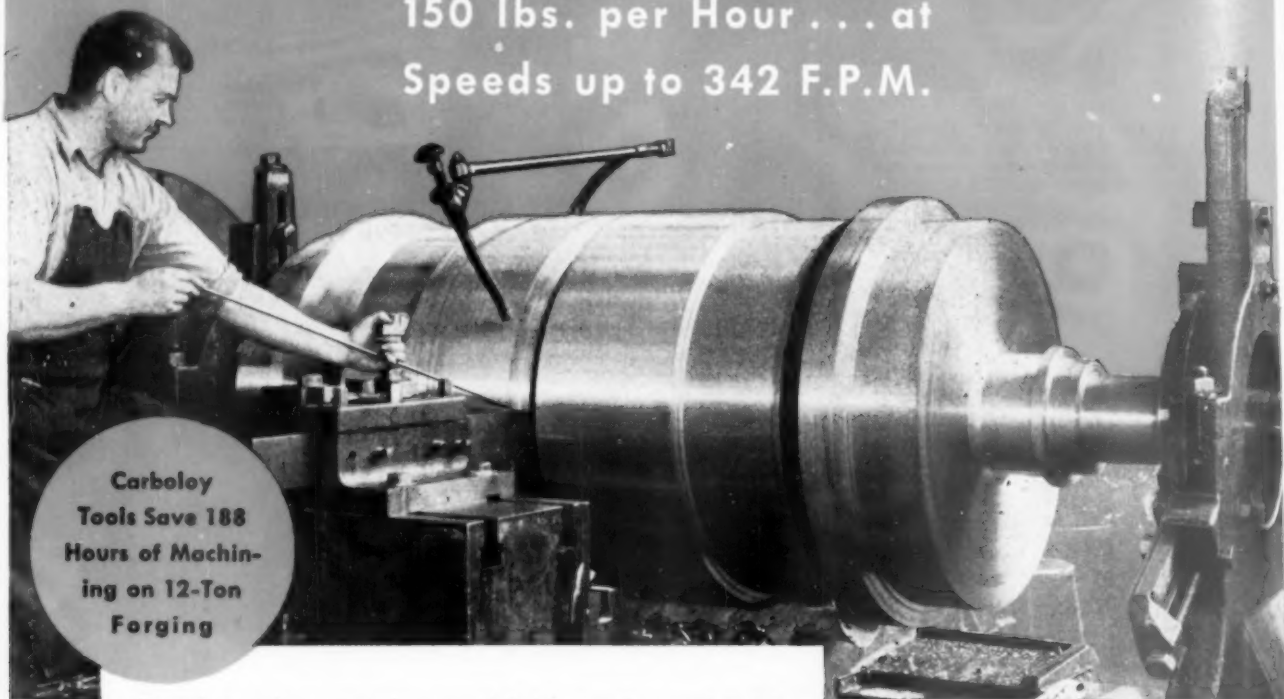
TOOL ROOM

AUTOMATIC

OIL COUNTRY LATHES

Removing 6 TONS of STEEL...

150 lbs. per Hour ... at
Speeds up to 342 F.P.M.



**Carboley
Tools Save 188
Hours of Machin-
ing on 12-Ton
Forging**

Rough turning, grooving, semi-finish turning and finish spacing, 12-ton forged steel rotors, for Navy turbines, is a job that's "tough" on tools. To complete these operations, six tons of steel are removed, with tools taking cuts often as deep as $\frac{3}{4}$ ". Indicative of the ability of Carboley tools to step up steel cutting production on heavy work such as this is the performance of Carboley Grade 78-B on this application. Operating at various speeds ranging up to 342 F.P.M., and feeds from .010" to .047" Carboley tools remove 150 lbs. of steel per hour, completing the job in $3\frac{1}{3}$ days of actual machining time instead of the 11 days 4 hours formerly required.

Carboley tools—with hardness ranging up to 92.5 Rockwell "A" and transverse rupture strength up to 295,000 p.s.i.—are designed for the entire range of steel cutting. There is a grade for every application on steel, whether your job involves heavy duty work—such as these rotors, or high-speed, precision finishing, holding tolerances as close as 0.0002".

CARBOLEY COMPANY, Inc., Detroit, Michigan
11145 E. 8 MILE STREET

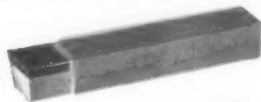
Birmingham, Alabama • Chicago • Cleveland • Los Angeles
Newark • Philadelphia • Pittsburgh • Seattle • Thomaston, Connecticut
Authorized Distributors: Canadian General Electric Co., Ltd., Toronto, Canada.
Foreign Distributor: International General Electric Co., Schenectady, N.Y.

Send for New, 16-page Vestpocket
Manual on Steel Cutting with Carbides

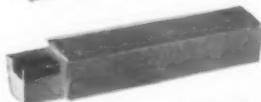


10 Standard Stock Styles for Steel Cutting

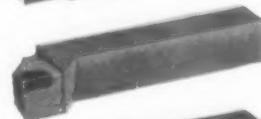
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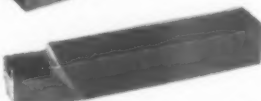
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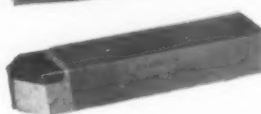
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Style 12



**TUNGSTEN
CARBIDES**
For Cutting
CAST IRON
and
Non-Ferrous Metals

CARBOLEY

(TRADEMARK) CEMENTED CARBIDES

**TITANIUM
TANTALUM
CARBIDES**
For Cutting
STEEL

FOR HEAVY HOGGING ... PRECISION FINISHING ... INTERMITTENT CUTTING

(Continued from page 124)

people will demand.

"We believe," Mr. Burt added, "that Pratt & Whitney precision coupled with the 'know-how' of Chandler-Evans engineering will produce developments of importance in American aviation."

New branch offices: Two in Ohio for the Detroit Tap & Tool Company, Detroit. The company, producing taps, thread gages, thread milling cutters and tapping and checking equipment for threads, now is directly represented in Cleveland and Dayton as well as Toledo, according to S. B. Hellstrom, general manager.

New concern: Formation of the Laughter Corporation, Dayton, Ohio, succeeding the Production Products Company there has been announced by D. R. Laughter, president.

Plans for the new company include an expansion program in engineering and production of machine tools, dies, jigs, special machinery and gages. Other company officers are: C. W. Wilson, vice-president in charge of Engineering; George Laughter, vice-president in charge of Sales; and W. D. Kindrick, vice-president, manufacturing.

Chicago plant: A. M. Sasgen, vice-president and general manager, Grand Specialties Company, Chicago, producers of time and labor saving clamps, has announced the opening of a new manufacturing plant in the Windy City.

The concern, one of the leaders in its field since 1921, recently was awarded the Army Ordnance Banner of Merit.

New Allegheny Ludlum Division: W. F. Detwiler, chairman of the board, Allegheny Ludlum Corporation, Brackenridge, Pennsylvania, has announced his company's acquisition of the Carbide Alloy Corporation, New York City. The property will be operated as Allegheny Ludlum's Carbide Division.

"The new Carbide Division," Mr. Detwiler said, "recognizes late developments in the field of metal-working and is calculated to round out Allegheny Ludlum's service to fabricating industries. It should prove to be a matter of major benefit under the necessities of rush war production, and no less important in peacetime."

Initial products of the new division will be highly developed cemented carbides, produced under processes established by Carbide Alloy Corporation, it was said.

"Later activities of the division will probably take into account developments which have long been under study in Allegheny Ludlum's Research Laboratories," Mr. Detwiler added in explaining that his company's expansion into the carbide field is a reflection of its intensive work in cutting materials in general.

Welding school: The Eutectic Welding Alloys Company, New York, recently concluded an intensive training course for its mid-western field engineers, employing the welding facilities of Utilities Engineering Institute, Chicago.

The school was selected as a training center, it was said, because of work

(Continued on page 129)

MOTOR MEMOS

Industry output now exceeds wildest pre-war dreams of its capacity. Production engineers are credited with cost reductions. GM predicts boom business



DETROIT—Accelerated summer and fall production schedules have raised the motor manufacturers' war production volume to a level that exceeds the wildest pre-war dreams of the industry's capacity.

The parade of war products streaming from automotive plants last month reached a \$10,000,000,000 annual mark, the Automotive Council of the Production reports after a nation-wide survey of the industry's productive units.

If a yardstick showing physical volume could be used, rather than dollar volume, the public might better appreciate the astounding production achieved by our erstwhile automobile passenger car and truck builders.

At the same time, the industry continually has been cutting costs of products delivered to the government and armed forces in the face of rising production costs and rising prices of non-war items turned out by other segments of American industry.

While no exact figures exist, it is known that the savings to Johnny Q. Public through the genius of automotive mass production methods already amount to several billion dollars. Thus, in terms of physical volume, and taking into account these cost reductions, the billion dollar a month output predicted for the industry by WPB's Donald Nelson has been achieved.

While some of the price cuts were obtained by renegotiation of contracts, the majority were made voluntarily by the industry, including reductions of \$16,000,000 by one firm making aircraft cannon, gun carriages and gun mounts.

Credit for the price-cutting short cuts goes to automotive production engineers. From Packard's assembly line, for example, torpedo boat marine engines and British Rolls-Royce engines are rolling out under an overall price cut of 18 per cent.

Improvement in nearly half the production steps in the manufacture of Oerlikon anti-aircraft guns has enabled

Pontiac to reduce costs 50 per cent.

Through the adoption of the automotive conveyor line technique for the production of wings for P-47 Thunderbolts and Fortresses, Murray Body has been able to cut prices by 37 per cent.

● **Big Job:** The industry's number one job today is aircraft. It will continue to get top billing next year.

Three years ago last month the industry's own William S. Knudsen came up from Washington to enlist the aid of the motor makers in expediting the war-plane program. Last month, the industry passed the \$4,000,000,000 mark in total airplanes, engines and aero equipment turned out since the former GM president made his plea for cooperation.

Two years were required by the industry to produce the first billion dollars worth of aviation equipment. The remaining three billion was turned out in the past twelve months.

Today, most of the 1,038 component plants of the automotive industry, located in 31 states, are delivering aircraft units at the rate of approximately \$11,000,000 a day. Annual volume now exceeds \$4,000,000,000, and is climbing.

Thus, the industry's annual aircraft production alone overshadows top automobile output in the rosiest year, 1929, when volume reached \$3,413,000,000.

● **Post War.** The man whose job it will be to get the assembly lines moving when peace comes caught their breath, took another look at Alfred P. Sloan's post-war production prediction and began to worry.

Production, General Motors' chairman says, will average 6,000,000 to 6,500,000 cars annually in the first three or four years after the war. Pre-war sales averaged 4,000,000 units annually.

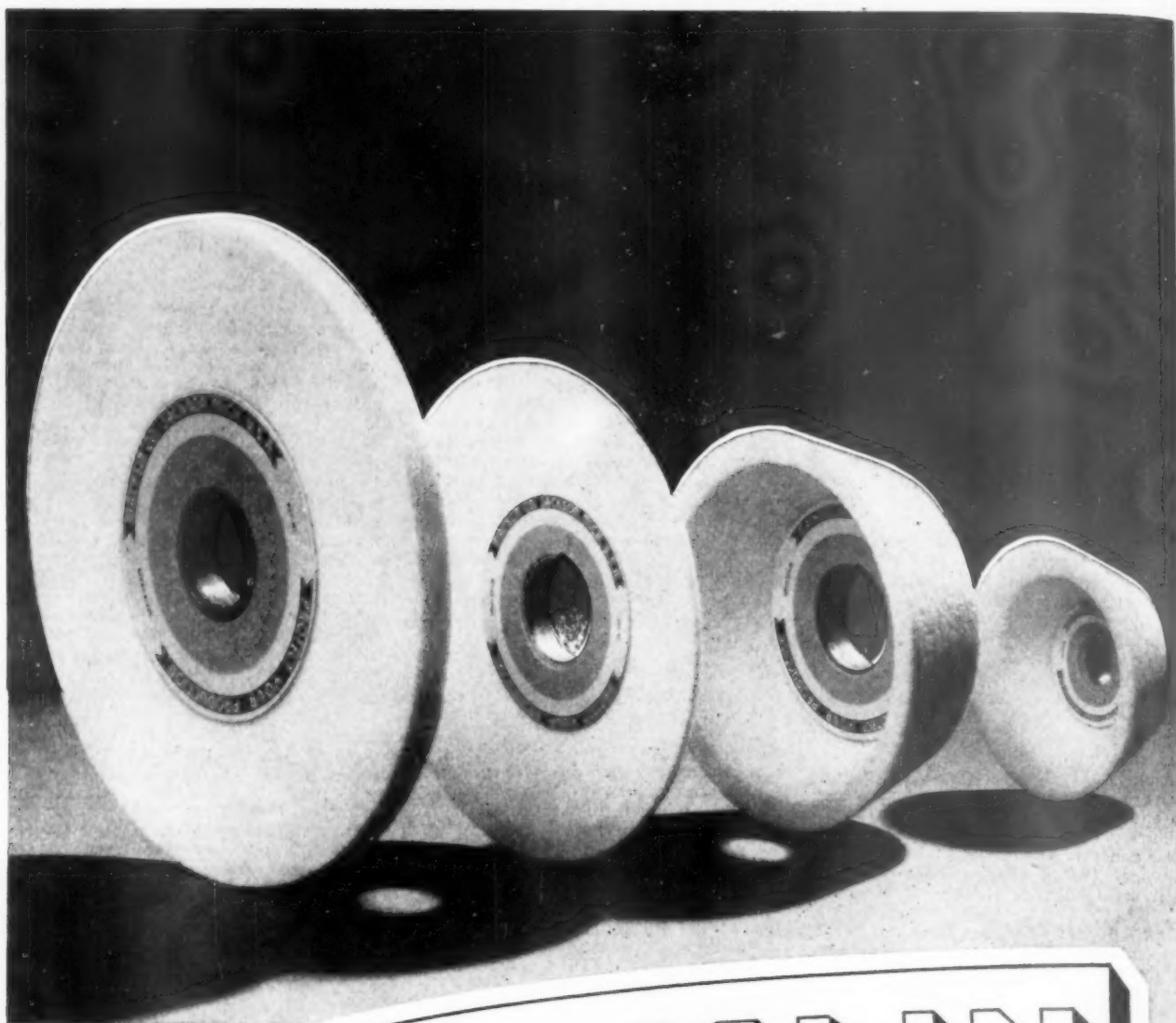
GM, he said, will have to spend about \$250,000,000 for conversion, will resume auto production four months after the armistice is signed and attain full output in another two months.

Metal and Tire Conservation

Fitting a 36-volt magnet to a regular high-lift electric truck salvages scrap in the main plant of Chrysler's Dodge Division.

Both magnet and platform are raised and lowered by electric control. The magnet has a bulk capacity of 3,200 pounds, and is run by the battery which powers the truck.





MACKLIN



MACKLIN high quality wheels
for every grinding purpose will
"Protect Your Production"
Ask for the services of a Macklin Field Engineer

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

(Continued from page 127)

done by its staff in conducting tests of the Eutectic product when first introduced in the United States.

Purpose of the course was to acquaint the company's field engineers with the most recent applications of the Low Temperature Process in production, salvage and reclamation, to enable them to familiarize war plants with these improvements.

Magnesium castings: New Jersey foundries of Bendix Aviation Corporation, among the nation's pioneers in perfecting casting of magnesium for the aircraft industry, now produce in one month a volume of magnesium castings equal to their entire output of all metal castings for all of 1939, the corporation's Eclipse-Pioneer Division has revealed.

Monthly production of magnesium castings in the four New Jersey foundries now averages nearly 400,000 pounds, it was said, and increased facilities soon will boost this total to exceed 8,500,000 pounds annually.

Complete mechanization of many Bendix foundry operations has contributed considerably to present high volume production, it was stated by company engineers. In 1931, magnesium castings represented only 17 per cent of the corporation's foundry output. Today, half the castings turned out by the New Jersey shops are of magnesium.

Expansion: Kelley-Koett Manufacturing Company, Covington, Kentucky, manufacturers of industrial x-ray equipment, is proceeding with a plant expansion program. The concern's war products include x-ray equipment for use in vital military, industrial and medical establishments.

New concern: One of Los Angeles' newest industries is The Accurate Machine Products Company, established by J. W. Boening and W. J. Phelan, to manufacture the I-G-C Countersink Relief Grinding Fixture.

The grinder is said by its builders to speed grinding operations as much as 300 per cent. These fixtures, formerly manufactured by the Industrial Grinding Company, fit any standard grinding machine and will take work from one-sixteenth-inch to one-inch diameter.

New branches: Colonial Broach Company, Detroit, has opened direct factory offices in South Bend, Indiana, and Cincinnati, the company states.

Baldwin office: The Baldwin Locomotive Works, Philadelphia, has opened a new district office in Boston, Ralph Kelly, president of the company has announced.

Wilbur H. Whitty, new office manager, will direct sales in the New England area for all divisions of the company including the Locomotive and Ordnance divisions, Baldwin-Southwark division, Cramp Brass and Iron Foundries division, Standard Steel Works division, Baldwin De La Vergne Sales Corporation, and Pelton Water Wheel Company.

Ohio outlet: E. W. Brock, formerly Service Manager of Genessee Tool Company, Fenton, Michigan, manufacturers of high speed steel cutting tools, (Continued on following page)

NOW you can RECLAIM HIGH SPEED STEEL TOOLS by WELDING right in YOUR OWN PLANT!

with
Suttonite
No.1 AND A NEWLY DEVELOPED No.2

The Welding Equipment & Supply Co. (originators of "SUTTONIZING", the first successful welding process for reclaiming HSS Tools) announce their recent development of SUTTONITE No. 2 Drawn Alloy Welding Rods, which with SUTTONITE No. 1 now make it possible for you to reclaim your high speed steel cutting tools by welding right in your own plant.

This announcement is of vital importance for, with SUTTONITE No. 2 the customary hazards experienced in the welding of broken HSS cutting tools has been eliminated. If you want to repair those broken tools in your plant it will pay you to wire or write for complete information today.



★
Here's the booklet that tells all about SUTTONITE No. 2 and how to use it in your plant. Don't fail to send for it today!

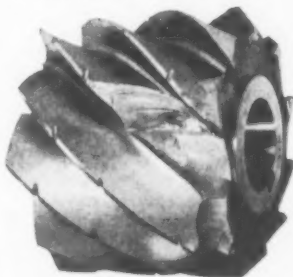
Distributors in principal cities of the United States and Canada.

WELDING EQUIPMENT & SUPPLY CO.

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EXAMPLES of TOOLS that can be RECLAIMED RIGHT IN YOUR OWN PLANT WITH SUTTONITE



6" x 5" x 2" slab mill with teeth fractured.

SUTTONITE No. 1 and No. 2 are used to reclaim milling cutters, broaches, drills, ball and end mills, reamers, taps, cutting tools for lathe, planer and shaper and special shape forming tools.



Same Slab mill as reclaimed by "SUTTONIZING." Also rough ground.

AIRCRAFT PRODUCTION

Novel tools, jigs and fixtures are used by West Coast concern in mass producing glider wings. Some operations speeded 300 per cent

LOS ANGELES—New methods and jigs and fixtures of advanced design are newsworthy contributions to a cargo glider wing building project by the Weber Showcase Company here.

Outstanding is the employment of infra red ray lamps to speed the drying of glue which holds ribs to spars in the wings. The "hot light" principle is used widely by industry, but seldom to perform such a precise job on hard-to-get-at corners. It is only one application of special tools by this concern to turn out wings faster.

Lamps: The company's engineers devised special reflectors for this task. Each houses a pair of 250-watt infra red ray bulbs. The lamps are coated outside with copper, which prevents corrosion, inside with nickel, which helps reflect the heat toward the working areas.

With these lamps, a temperature of 117 degrees is quickly reached at the glue line, and the drying ends in 90 minutes, said to be more than 3 times faster than formerly possible. The lamps are placed between the ribs after the assembly has been located leading-edge down in a vertical jig. Lights always are at the proper distance from the line to be heated.



Weber Showcase photo

Infra red light and novel fixtures speed output of glider wings in Los Angeles. Previously fabricated leading edge nose skin is shown beside wing framework.



Machines: Using an idea developed in metalworking, a specially-devised machine contour-planes laminated cap strips. A cap strip is a beam, in this case 24 feet long, made up of several plies, each one-half inch thick.

To smooth it according to required complex contours, a multiple, direct drive planer is used. A roller-coaster guide controls the head until, after five passes and 30 minutes later, planing of the strip is completed. Seven hours formerly were required to complete this operation, Weber engineers said.

Jigs and fixtures: Spars for both in-board and outboard wing sections take form in steel jigs that are novel but simple. These are made in 3 parts—the flat steel bed, one stationary angle and one sliding angle.

The distance between the two angle faces is fixed by cam-action locking handles. In order to close the sliding angle, the operator turns the cam handles a quarter-turn, or until it strikes the pre-set stop. At that point the angle is automatically locked in place.

To assemble the spar, caps are first placed in the jig. Then bulkheads, diaphragms and internal blocking are positioned and secured. Now, the plywood web, previously sub-assembled, is glued to the caps and the internal structure by means of hand clamps and heavy pressure blocks. After this assembly dries, it is removed from the jig and the second web glued in place.

Temperature and atmosphere: Wing fabrication takes place in two areas, both of which are insulated to control humidity and temperature. In the general assembly area, oil heaters and atomizing water spray machines suspended from the ceiling combine to maintain temperature of 72 degrees, F., and above, and a relative humidity within a 45-65 per cent range. Inside the dope room proper, similar installations hold the temperature at 80 degrees, humidity at 55 per cent.

Handling devices: Wing handling is facilitated by use of company-developed swivel-type handlers. These allow wing sections to be rotated 240-degrees on the horizontal axis without touching the floor, enabling workers to reach all parts with their spray guns and dope brushes.

Two tripod stanchions, connected by a spreader bar, are required to handle an inboard wing. The section is connected through its fittings to T-bars, which are mounted on bearings attached to the stanchions. An indexed disc on the root-end T-bar permits a worker to rotate the wing chordwise, thus shifting its position as doping progresses.

A single tripod stanchion handles the outboard section, which is of cantilever construction and does not permit attachments at the tip. The handler used here employs a single stanchion equipped with special spreader legs which insure stability.

(Continued from preceding page)

now represents the company as Service-Sales manager of a new factory branch office in Cincinnati.

Larger facilities: E. Karelson, Incorporated, New York, 92-year-old producers of diamond pointed trueing and cutting tools, has moved into a new, larger plant. The new facilities provide six times the company's former capacity, it was said.

Silver Babbitt: National Bearing Metals Corporation, St. Louis, Missouri, with the authorization of the Battelle Memorial Institute, now is producing silver babbitt metal. The new metal, said to be comparable to tin-base babbitt, was developed by the Institute to meet the wartime shortage of tin.

Post War: The National Tool Company, Cleveland, has become one of the first American manufacturing concerns to announce completion of its post-war plans.

Producers of precision metal cutting tools, National Tool officials state the company will experience no post-war readjustments, and will serve makers of automobiles, aircraft, ships and similar products in peacetime. President A. J. Brandt and Executive Vice President S. J. Kornhauser report capacity production, with volume for the first half of 1943 well above that of the same period last year.

Fairchild Expansion: An increase in production and "great savings in man-hours and money" is expected by Fairchild Aircraft as a result of its acquisition of two new plants in Hagerstown, Maryland.

The two plants, one a former shoe factory, the other a knitting mill, will be used as material control offices, warehouses and manufacturing space.

ABSENTEEISM

● Absenteeism is considered a crime in bomb-scarred Britain.

As an example of the English attitude regarding the failure of every individual to contribute to the limit of his ability on production, the London Daily Mirror reports that one war worker there, John Barber, recently was sentenced to 14 days in jail for being absent without a reasonable excuse from his job in a war industry.

TOP MANUFACTURING STATE

● Michigan regains lead in volume of manufacturing

On the basis of war production volume, as compiled by the War Production Board, Michigan has regained the position it once held during peacetime as the nation's number one manufacturing state. New York now ranks second and California third.

Plants located in Michigan have received \$11,469,576,000 in orders, or 10.5 per cent of the total of \$109,886,573,000 in major war contracts. California leads (Continued on page 134)

THE TOOL ENGINEER

Change to Broaching

REDUCES SCRAP 97%



Before our Defense Program began, rifling in gun barrels was done by the same single point cutter method that was used in the last war. The cutter made several passes at a very low speed. Errors in indexing and lead could not be avoided. Scrap loss averaged about 6%.

Obviously, such a method could not supply our expanded Armed Forces and so a method of broaching the rifling with a spiral spline broach was developed. The accuracy and speed obtained by broaching not only provided our Armed Forces with plenty of the

**GUN BARRELS
PRODUCED 18,586**

**GUN BARRELS
SCRAPPED 41**

**PERCENTAGE
OF SCRAP 0.2%**

best rifles in the world but scrap loss was cut to the very low figure of 0.2%. Many hundreds of broaches for rifling gun barrels up to 37mm. have been manufactured by Detroit Broach Company.

Broaching today offers many advantages to manufacturers throughout the metal-working industries. The engineering staff of Detroit Broach Company is at your service to help you increase production . . . improve quality . . . lower costs. Call or write now.

COMPLETE BROACH SERVICE



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Kingsport, Tennessee

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★ THE YALE & TOWNE MANUFACTURING
COMPANY
Philadelphia, Pennsylvania

★ YORK CORPORATION
York, Pennsylvania



- 1 1 1/2" left hand spiral, right hand cut end mill.
- 2 1 1/2" two flute, double end router bit.
- 3 1 1/2" extra long, four flute, double end mill.



Even These Are STANDARD TOOLS ON HAND FOR 48-HOUR DELIVERY

Standard lines of Putnam Hi-Speed End Mills include not only every popular size and type of tool but many which, from any other source, would be considered "special" cutters. As examples, the three tools illustrated are carried in stock. These, like all other standard Putnam Tools, are now available for 48-hour delivery.

For complete information, see your nearest Putnam representative or write directly to the factory.



PUTNAM TOOL COMPANY

2987 Charlevoix Avenue • Detroit 7, Michigan



How to get

TOOLS THAT OPEN THE DOOR

to Increased Output Per Machine...

IN MOST PLANTS, machine and press speeds are continually checked. But still another way to get more output is to make a study of machine shutdown time caused by premature tool failure.

And your tool room is the place to start the job of eliminating much of the time spent repairing, regrounding or replacing tools.

In thousands of plants, Carpenter is helping to get at the causes of these delays. Through the Carpenter Matched Set Method a definite system is provided for picking the proper tool steel for each job.

But Carpenter's aid to tool steel users includes more than help in the selection of the proper tool steel. For example, the Tool Steel Manual shown here can be used to simplify heat treatment and do a trouble-shooting job in your tool room. And of course, your nearby Carpenter representative is ready to give you the benefit of his diversified experience with tool steel problems. Get in touch with him.

**Put this Printed Help
to Work on Your Problems!**



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The Carpenter Steel Co., 122 W. Bern St.
Reading, Pa.

**Carpenter
MATCHED
TOOL STEELS**

HOW THE MATCHED SET METHOD WORKS



**For Greater Toughness
He Followed the Diagram**

THE JOB: Piercing slots in 14 gauge hot-rolled steel—at 1,200 pieces per hour.

PROBLEM: The piercing die would break after about 2,500 pieces. Heat treatment and hardness were OK, so the Superintendent checked the Carpenter Matched Set Diagram for a steel with greater toughness. He found that Carpenter R. D. S. was the steel best suited for the job. And here are the results:

1. Tool life increased from 2,500 to 1,000,000 pieces.
2. Production up 39,400 pieces per month, by eliminating 33 hours of tool-caused idle press time.



**Better Wear Resistance
Gave Longer Tool Life!**

THE TOOL: A cut-off blade for shearing ball bearing slugs.

PROBLEM: Tool life was too short, causing frequent replacement and much wasted time. A tool steel with maximum wear resistance was indicated.

SOLUTION: The solution was easy with the Matched Set Diagram on the job. The Tool Room Superintendent selected Carpenter Hampden for the job. And with Hampden, shutdown time decreased and production per tool was increased 30%.



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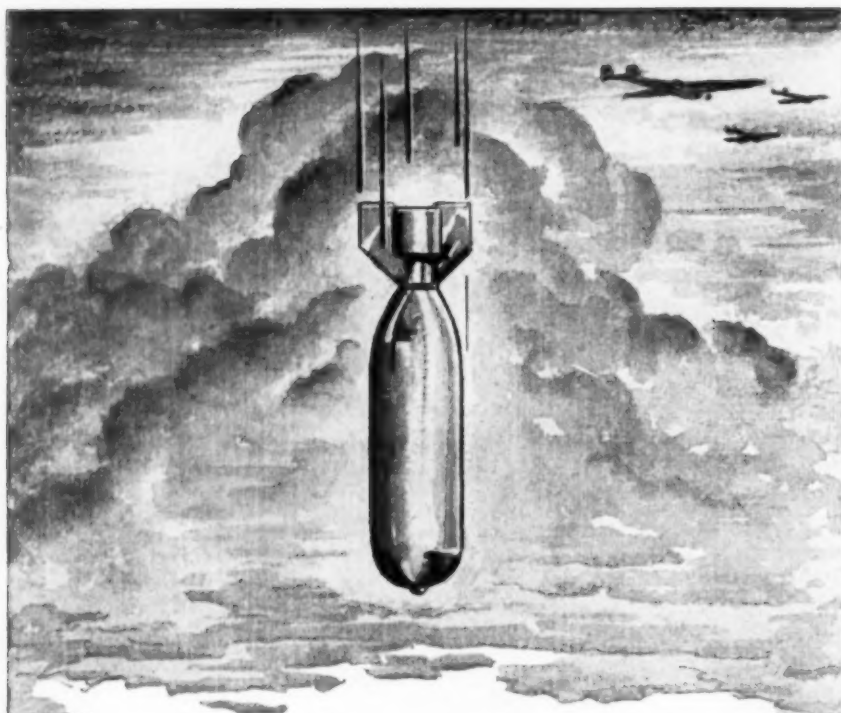
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When the **LAST BOMB DROPS**

Of course we are all looking forward to that day with much anticipation.

But there are still many things to do.

Here at Pioneer Engineering we are doing everything we can to bring that day of Victory closer.

Our engineers—over 400 of them—many scattered over the United States—are giving manufacturers the kind of help they need to speed up production—by introducing new methods that cut corners—by designing new dies and fixtures that improve processing—by making use of old equipment that is available and bringing it to new and better standards—altering practices to achieve higher output...

However, when the bombs stop and they will eventually stop—almost overnight—production will be abandoned! How ready will you be to resume peacetime production—either making what you had been making or producing some entirely new product?

There are definite advantages in having you discuss your future plans with us before that eventful day comes in order to be ready to change to peacetime production with the least amount of lost time.

Send for a copy of our new Brochure which tells a graphic story of how helpful we can be to you.

**ENGINEERS
DESIGNERS
CONSULTANTS**

**PIONEER ENGINEERING
AND
MANUFACTURING CO.**

**19645 JOHN R
DETROIT 3, MICH.**

INDUSTRIAL NEWS DIGEST

(Continued from page 130)

all states in the volume of aircraft contracts held, followed by New York and Michigan. California likewise holds the largest portion of shipbuilding orders, but the auto plant capacity for miscellaneous munitions put Michigan in the lead for total volume.

MATERIAL CONSERVATION

•Planning use of stock results in substantial annual savings

EAST SPRINGFIELD, MASS.—Intelligent planning by the War Production Committee of the Westinghouse Electric and Manufacturing Company plant here results in saving more than four tons of vital materials in one department every week. The average weekly conservation, company engineers state, is 3,300 pounds of sheet aluminum and 5,300 pounds of sheet steel.

Saving is accomplished chiefly by carefully assorting, according to thickness, all left over ends resulting from shearing operations.

Leftovers are then used for the fabrication of small parts. Thus, the larger sheets of steel are available for products requiring a larger surface area of stock.

Ordinarily the short end pieces would be sent to the salvage department and eventually be returned to the metal processors. Now, production schedules are carefully planned so that the larger pieces are cut first, then smaller pieces in order of size.

Westinghouse production men estimate that 165,000 pounds of new sheet aluminum, and 265,000 pounds of steel will be saved in one year at this plant.

NEW ALUMINUM FORGE

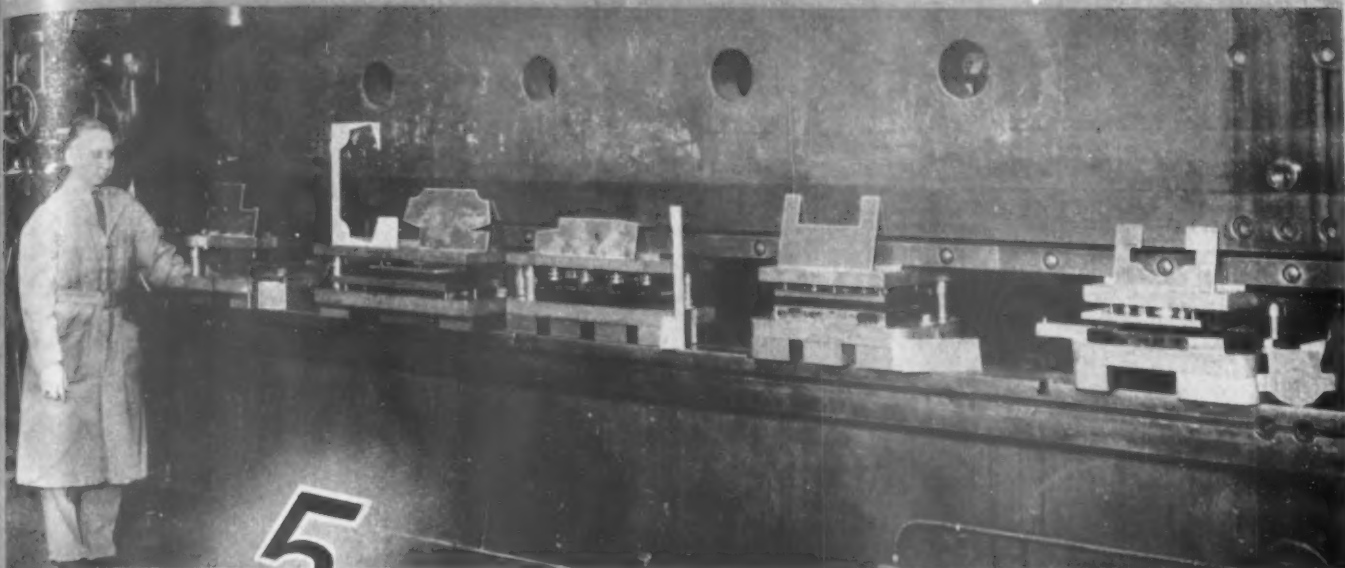
•GM's Chevrolet opens fourth aluminum forging plant

ANDERSON, IND.—With the commencement of production last month at Chevrolet's newly-opened aluminum forge plant here, the fourth such unit in the General Motors division's nationwide manufacturing system, the auto industry became more firmly entrenched in the light metal field.

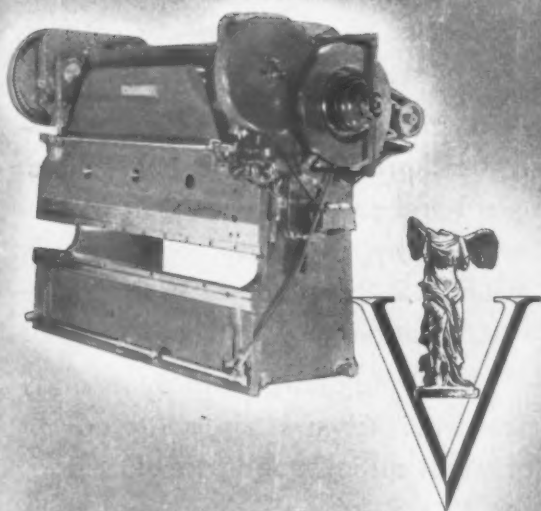
During the past year, M. E. Coyle, GM vice president and Chevrolet general manager, said, millions of pounds of aluminum aircraft forgings a month have been delivered by the company to aircraft manufacturers and to its own plants producing Pratt & Whitney engines. Additions to the new facilities, completely reconstructed and equipped along modern forge plant principles, will expand this output to record proportions.

Formerly used as a wire mill, the Anderson property covers 21 acres. The buildings and site were turned over to Chevrolet for conversion and operation early this year by the Defense Plant Corporation. So complete was the remodeling program, Coyle said, that only the shells of the original buildings were retained.

Some of the heaviest equipment of its kind is employed at the new location, including heavy hydraulic presses, (Continued on page 142)



5 PER STROKE...



Whether war time gun carriages or peace time refrigerators—multiple blanking set ups speed production and cut costs.

The smooth power and accurate performance of Cincinnati Press Brakes give you a "finished Job."

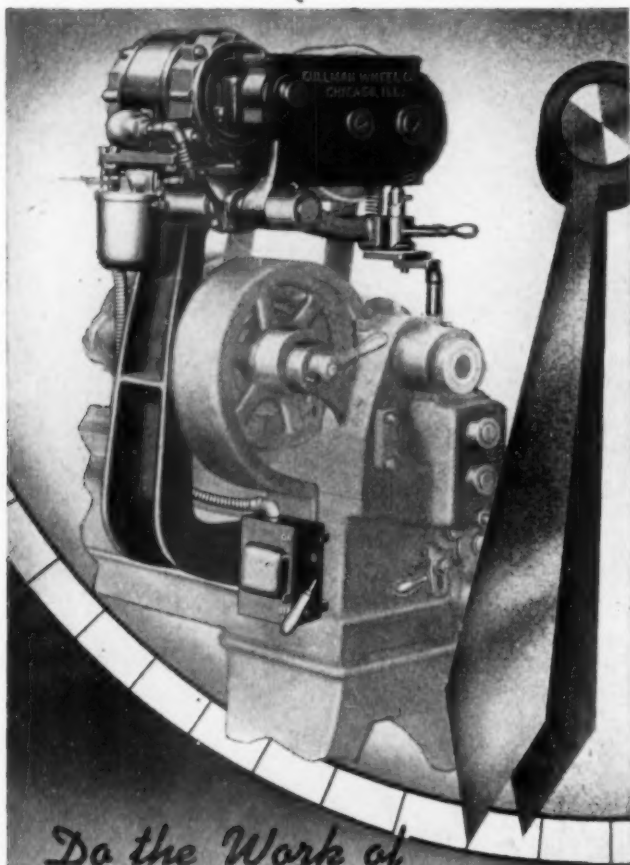
Write for descriptive Catalog No. B-1.

The many uses of Cincinnati Press Brakes will interest you.

THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES



Do the Work of
12 Hours in 9 with
CULLMAN DRIVES

With the ever-increasing demand for faster delivery it is vitally important to get maximum production from every machine and man-hour.

Cullman Drives will modernize shaft and belt driven lathes, screw machines, shapers, and similar equipment to give an increased output of more than 25%.

Cullman Drives give individual machine control, have greater flexibility, and are safer in operation than overhead line shaft drives. They permit the utmost in efficient arrangement for work flow and lighting.

Cullman Drives are sturdy and built for long life. They operate with belt-drive smoothness. They are easy to install and economical to buy. They are built for motors from 1/4 to 15 H.P. Prompt delivery can be made on most sizes.

Write for full information on Cullman Drives and the 60 day trial plan.

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NOW . . . MORE PRODUCTION
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MILFORD PROFILE SAW



THE BLADE
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A new, automatically controlled method of heat treatment, developed and perfected in our own shops, now provides a uniform depth of hardness to every foot of PROFILE SAW. "Etching" tests of sample pieces of each saw guarantee it!

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**Order from your
mill supply distributor**

. . . If you have not yet adapted your band saw machines to Profile Sawing, write us for directions, giving description of your machines and cutting jobs you have in mind.

THE HENRY G. THOMPSON & SON COMPANY
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What will users want in **POSTWAR** Machine Tools?

1. VERSATILITY will be a primary requirement of many machine tools sold in the postwar period . . . but versatility achieved without sacrificing high production rates and low production costs. Following every war, old products become obsolete and new products are developed with startling speed. Manufacturers must have machines which can be quickly and easily adapted to new purposes.

Exceptional versatility is characteristic of many machines equipped with Vickers Hydromotive Controls. The hydraulic method of control and power application is inherently the most flexible. There are more than 5,000 Standardized Vickers Units that can be combined to exactly supply every hydraulic power and control function:

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| (1) any feed rate | (4) any sequence of motions |
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Vickers Application Engineers will be glad to discuss how the versatility and the many other advantages of Vickers Hydromotive Controls can be applied to your machines.

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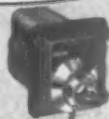


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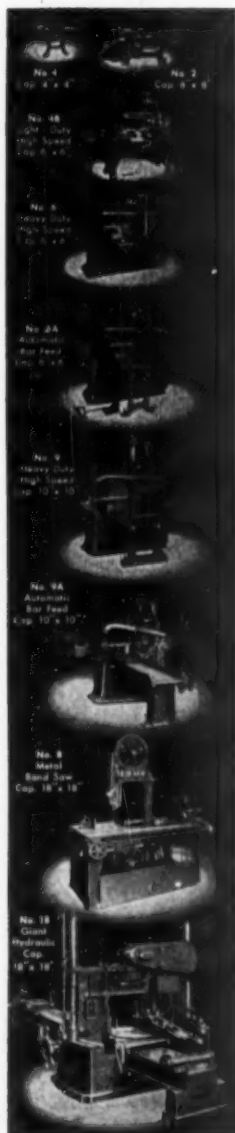
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How would you do it?



(Cutting an I-Beam that has been rolled into a large diameter ring into segments. A typical example of the versatility of the No. 8 MARVEL Band Saw)

At the Kling Bros. Engineering Wks., Chicago, manufacturers of rolled structural shapes, three MARVEL No. 8 Metal-cutting Band Saws are proving "A-1" and "100%". In the MARVEL System there are saws exactly suited to every shop's need—and for structural shapes, the universal MARVEL No. 8 is ideally suited, because it handles all work up to 18" x 18" cross-section and does cutting-off, mitering and notching. The blade feeds into the work at any angle from 45° right to 45° left. It is the most versatile metal-cutting saw built.

Buy from your local distributor

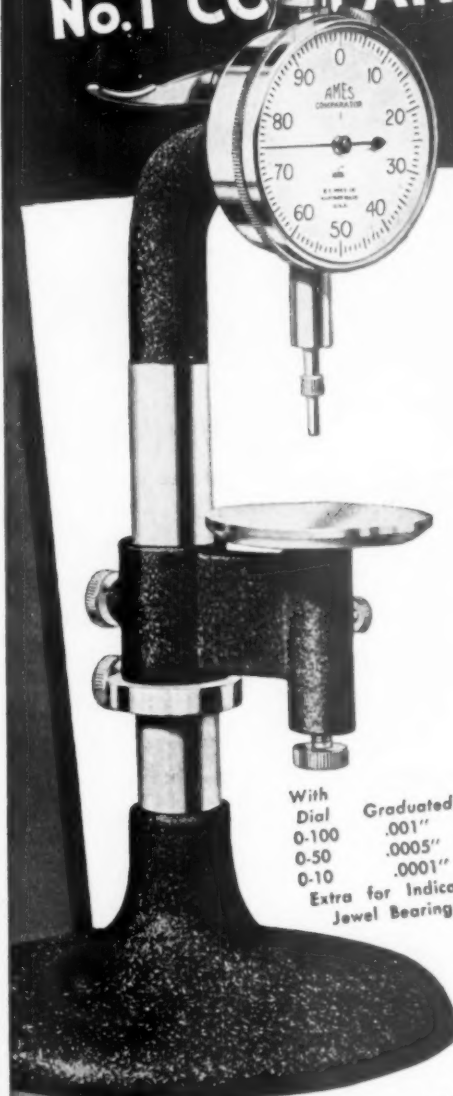
**ARMSTRONG-BLUM
MFG. CO.**

"The Hack Saw People"

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AMES No. 1 COMPARATOR



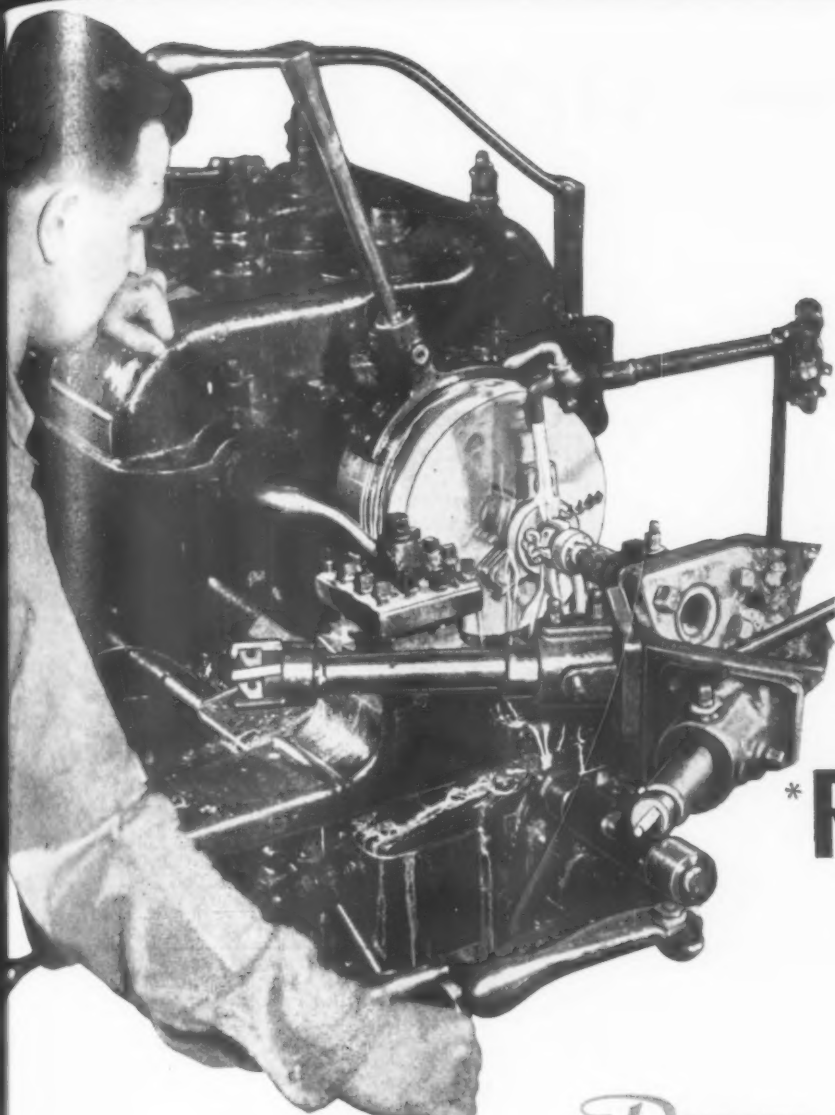
With Dial	Graduated	Price
0-100	.001"	\$30.00
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The Ames Comparator No. 1 stands 9½" high, has a table that is adjustable for height and will measure objects up to 2" in cross section. The indicator is 2¼" in diameter and offered in a variety of dial graduation numberings and values. The lever at left is pressed down to lift the indicator spindle, while releasing it permits the spindle to return quickly. Other models are shown in catalog No. 54.

Send for a copy.



B. C. AMES CO., WALTHAM, MASS.



WETMORE *Adjustable* REAMERS

*** RUGGEDNESS**
for long life,
heavy cuts

*R*UGGED construction, along with the inserted blade feature, is another Wetmore characteristic that means lower machining costs through long life and the ability to take heavy cuts.

Reamer and Boring Bar parts are made of the highest quality alloy steel, specially heat-treated for strength, toughness and long life. Standard blades are high-speed steel, with special heat-treatment to insure long life and low cost per hole. Cast alloy or tungston carbide tipped blades are also furnished.

Wetmore tools are used in top-flight metal-working plants all over the country because they have a combination of design features found in no other reamers or boring bars. Let us help you solve your production problems.

STOCK DELIVERY

Wetmore standard Reamers are now available from stock for quick delivery; and unusually good delivery is made on Boring Bars and special tools. Phone, write or wire.

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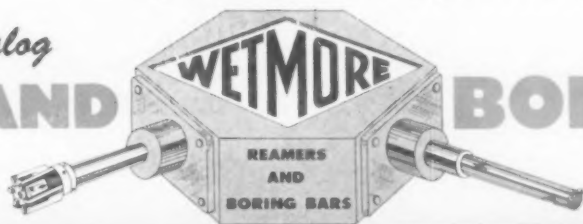
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REAMERS AND



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Ingenious New Technical Methods

Presented in the hope that they will prove interesting and useful to you.

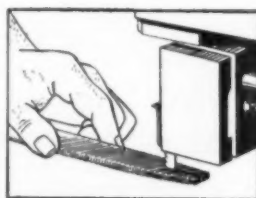
Hard Steels Cut by Heat Generated by Super High Saw Speeds

Ordinary hand-saws, when operated at unbelievable high speeds up to 12,000 feet per minute, cut through hard steels and alloys by heat generated from the friction of the saw against the metal to be cut. The cutting effect is more that of burning through the metal than actual cutting. The heat generated is sufficient to melt or burn out the metal in the saw cut but not enough to draw the temper on the sides.

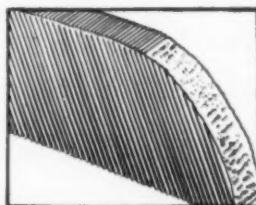
The hardness of either saw or metal to be cut is of little importance. Thin metal sheets are cut like paper, and plates up to one inch in thickness can be cut at speeds of ten inches per minute.

We hope this has proved interesting and useful to you, just as Wrigley's Spearmint Gum is proving useful to millions of people working everywhere for Victory.

You can get complete information about this method from Bell Aircraft Corporation, Buffalo, New York.



Proof of ability of new method to cut hard materials is demonstrated by operator cutting a file.



The temper of curve cut section shown above is unaffected.

NOW is the time...

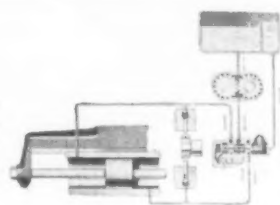
TO DESIGN OR REDESIGN YOUR EQUIPMENT FOR HYDRAULIC ACTUATION

Those one, two or three year old machines in your plant are about three times older today than they would have been under normal working conditions. When they need rebuilding, **REDESIGN THEM** with Barnes Unit-Type Hydraulic Circuits. You'll get a better machine. They also save design and assembly time on new machine designs.

How to do it

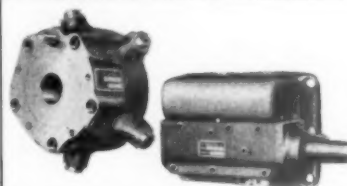
1

Send in a complete description of your present machine or the hydraulic requirements of your new designs. We'll design a complete circuit using standard Barnes hydraulic elements.



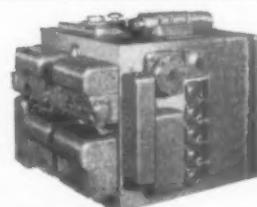
2

Barnes pre-tested and perfected elements such as pumps and valves will be assembled in the proper circuit to suit your job.



3

Your circuit will be housed as a self-contained unit or panel and shipped to you complete for assembly. Panel assemblies are ideal for application where machine base serves as oil reservoir.



4

Merely connecting two pipes to each hydraulic cylinder and mounting the unit or panel completes the hydraulic installation.



FREE DATA 40-page booklet contains detail descriptions of all Barnes elements and typical installation circuits. Write for your copy today. Ask for bulletin T. E. 1243.



John S. Barnes Corporation

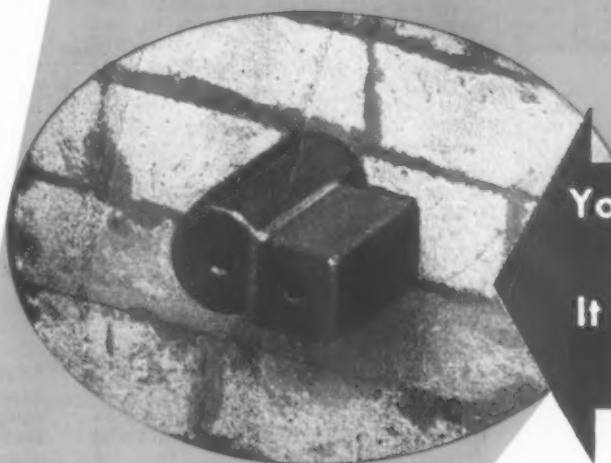
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AND FACTORY
ROCKFORD, ILL.

Announcing the **NEW** **SEALED-ELECTRODE** **Salt Bath Furnace**

The Greatest

**ADVANCE IN THE
DESIGN AND
CONSTRUCTION
OF SALT BATH
FURNACES**



**You Need Not Replace
this Electrode
It is Bricked-in
Permanently**



- Eliminates all necessity for changing electrodes
- Improves operating efficiency
- Faster starting
- Cheaper hold-over
- Permits vertical hardening of long tools
- Small production treating of small tools
- Work cannot be burned
- No "down-time" for changing electrodes
- No material costs for new electrodes

Send for complete information now.

See this furnace in actual operation in Detroit. One of the largest commercial heat treaters has a battery of the New Sealed-Electrode Salt Bath Furnaces in operation. Available for your inspection at anytime.

Upton **ELECTRIC FURNACE DIV.**

UPTON Electric Salt Bath Furnaces are available for Every
Metallurgical Heat Treating Requirement from 300° to 2500° F

(Continued from page 134)

large homogenizing furnaces and upsetters, one of which weighed 353,000 pounds before installation.

Two of the plant units, each nearly 550 feet long, are used in processing work and will house the heat treating furnaces. A third has been converted into the main aluminum forge plant, where the heavy presses and forging equipment are installed, while a fourth houses the materials testing laboratory, kitchen and cafeteria.

The new unit is operated under the supervision of the Chevrolet forge plant at Muncie, Indiana, first of the division's forging units to get into volume production aluminum.

ABSENTEEISM CUT

•Novel Method reduces stay-aways to 2.5 per cent

WILLIAMSPORT, PA. — Preservation of a low rate of absenteeism by the Lycoming Division of the Aviation Corporation here in the midst of high absenteeism throughout the industry, has been revealed by P. E. Garlent, Division Manager. The average for the last six months has been less than 2.5 per cent, he said.

The outstanding record at the Lycoming aircraft engine plant has attracted the attention of other aviation concerns who have sought the reasons as aids to solving absentee problems elsewhere. According to Garlent, the

record is due to the loyalty of the majority of workers and to supervision by the personnel department designed to protect the efforts of the majority from the effects of the below-par records of a few.

In the Lycoming system there are four recognized reasons for workers being absent: A worker is sick, or he is recovering from an accident suffered in the plant, or he is absent with permission because of personal business, or he is absent without leave.

If an absent person notifies the personnel department that he is ill, and that person is known to be trustworthy, he is taken at his word. If there is some doubt, or after several days have elapsed, a company nurse visits the home to assist or investigate the case. Plant first-aid station records back up the report of the absent one that he is away because of an accident while at work.

Arrangements can be made in advance for absences caused by unavoidable personal business situations. The personnel department makes every effort to be just in handling such applications.

Those absent without excuse or permission are not permitted to resume work without an interview by the personnel department. The absentee's time card is removed from the rack and deposited in the personnel office. A pink slip appears in its place in the rack, stating that he must appear there before going to his post. His time

doesn't start until the clock is punched and this cannot be done without the regular card. If the personnel department is satisfied with the worker's explanations of his absence, the card is returned.

Contrary to the experience in most war production plants, women workers at Lycoming, who now constitute 25 per cent of the total force, have a consistently better absentee record than men.

Closely tied in with this attendance record are Lycoming's safety achievements. This AVCO division experienced only 29 lost-time accidents during the year ending July first. During four months of that year, there were no lost-time accidents at the plant.

A lost-time accident is one causing the individual to lose time beginning with the shift following his regular shift. There were 8,500,000 man-hours of work last year at Lycoming.

DEMAGNETIZING

•Arc-welding equipment used to demagnetize tools and dies

SCHENECTADY, N. Y.—Ingenuity has often led to the use of arc welding equipment in solving problems other than those involved in the fabrication of metals. Among these, for example, have been the use of d-c equipment in thawing out pipes and warming air-
(Continued on page 144)

PRECISION HONING

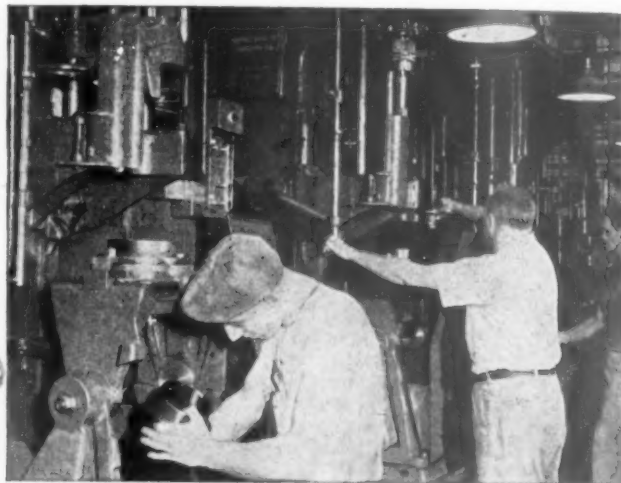
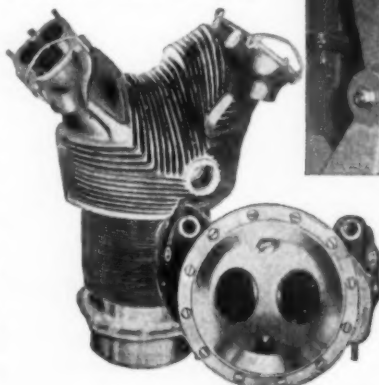
within .0005" to .001"

in aircraft production

BARNESDRILL Honers provide precision accuracy within .0005" to .001" in aircraft production. This kind of accuracy and surface finish is essential in the aircraft industry for best performance of their products. Honing removes defects of previous operations and corrects inaccuracies in rough machined bores.

Adapt Honing to Your Work

BARNESDRILL Honing Machines are made in vertical, horizontal, and angular types with one or more spindles. **BARNESDRILL** engineers will recommend the proper type and model of honing machine for your specific production requirements.



Part of battery of **BARNESDRILL** No. 307 Honers arranged with trunnion tip-over jigs honing aircraft radial engine cylinders.

Made of very hard metal, these Wright Cyclone Cylinders demand the most rigid requirements for precision finishing and are honed quickly by **BARNESDRILL** Honers.

Free Honing Data

Complete details of the honing process and our entire line of Honing and Drilling Machines are contained in Bulletin T. Send for a copy now.



Barnes Drill Co. 848-71 CHESTNUT STREET
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TENSION!

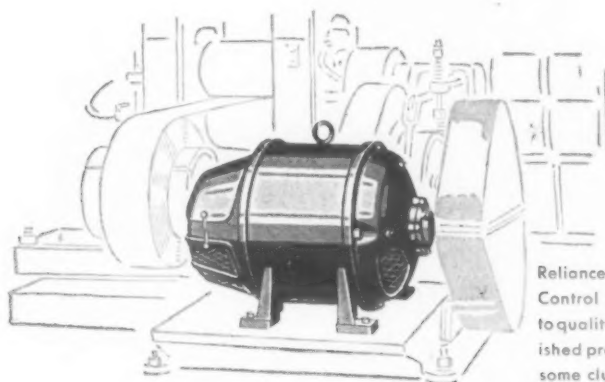


Tension Control can be an important production factor in the processing of such materials as metals, paper and cloth, which are wound on drums or cores. Tight, evenly-wound rolls and uniformity of the finished product often depend upon it.

All of the characteristics necessary to

maintaining proper and constant tension control are inherent in Reliance Electric Motor-Drive.

The pioneering work done by Reliance engineers in putting motor-drive to profitable use along these lines proves again that motor-drive *can be more than power*. The results of their experience are available to you at any time.



Reliance Motor-Drive for Tension Control contributes substantially to quality and uniformity of the finished product, eliminates troublesome clutches—and lowers costs.

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Get FLEXIBILITY FOR WAR WORK With BAKER MACHINES!

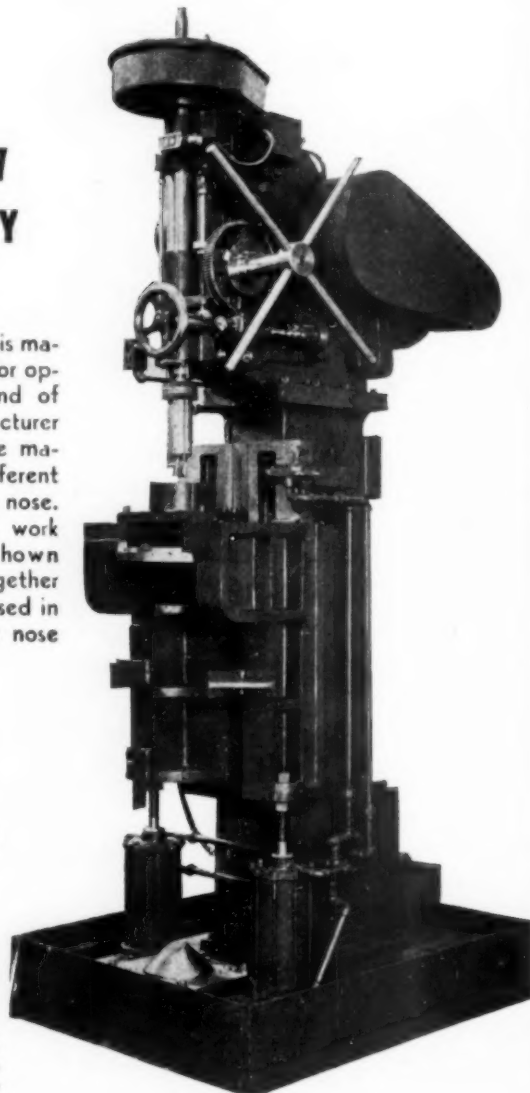
MODEL 217 HEAVY DUTY DRILL

The illustration shows this machine specially tooled for operation in the nose end of bombs. One manufacturer uses a battery of these machines to perform 4 different operations in the bomb nose. On this machine the work holding fixture is shown mounted in place, together with the cutting tools used in boring and facing the nose end.

**Write for
Complete
Information**



AWARDED FOR EXCELLENCE IN WAR PRODUCTION MARCH 20, 1943



Operations handled on this machine include: 1. Drill from the solid. 2. Rough coredrill and rough face. 3. Finish ream and face. 4. Tap. These operations are handled on individual machines, rechucking for each operation. This mechanical feed machine is arranged with holding fixture and increased clearance to accommodate 500 pound bombs. With extra adapters, the machine can also handle 1000 pound bombs.

BAKER BROTHERS, INC.

TOLEDO

OHIO

INDUSTRIAL NEWS DIGEST

(Continued from page 142)

plane engines in cold weather.

Now, a-c arc-welding transformers, equipped with stepless control, are being used to demagnetize steel parts by a method similar to that employed by jewelers in demagnetizing watches, according to R. F. Wyer, General Electric welding engineer.

E. L. Bailey, electrical engineer, Chrysler tank plant, Detroit, first used the method to remedy trouble caused by metal parts clinging to dies which had become magnetized.

Five or six turns of cable were wrapped around the die and a heavy 60-cycle alternating current from a G-E 500-ampere a-c welder was passed through the cable, the current then gradually decreased by turning the current-control crank on the welder. This procedure now is regularly used in the automobile concern's plants.

The widely expanded use of highly hardenable alloy steels in war production has brought to light numerous instances where permanent magnetism has caused trouble in arc welding, as well as in the operation of tools.

METALS RECOVERED

•Aircraft Scheduling Unit recovers unused allotments

DAYTON, OHIO—More than 100,000 tons of steel allotments; 22,000 pounds of copper allotments and 85,000 pounds of aluminum allotments for the fourth quarter were returned as unused to the Aircraft Scheduling Unit by the aircraft industry, according to Colonel E. W. Rawlings, newly appointed Administrator of the ASU at Wright Field.

The ASU determines the requirements and allocates materials, tools, and equipment needed to maintain aircraft production schedules. It is composed of Colonel Rawlings, Army Air Forces; Captain C. H. Gillilan, USN, for the Navy Bureau of Aeronautics; and Colonel W. S. Cave, for the British Air Commission. It serves as the sole government agency authorized to contact the aircraft industry in the execution of delegated functions from the Aircraft Resources Control Office.

ARCO is the executive agency for WPB's Aircraft Production Board and is designated as the claimant agency under the Controlled Materials Plant which the Aircraft Scheduling Unit operates for the air program.

The enormous turnback of allotments represents the aircraft industry's and ASU's achievement in the campaign against the failure of industry to place material orders up to the amounts authorized by CMP allotments.

"Cooperation of the aircraft industry with the ASU in the elimination of 'attrition' has thus far been outstanding," Colonel Rawlings said. He emphasized, however, that more cooperation and work is necessary.

Most encouraging aspect of the 'attrition' problem is the improved material situation. Sufficient capacity exists now and in the future to take care of all valid aircraft demands. Moreover, ASU policy is to hold allotment reserves large enough to permit immediate processing of necessary supplement-

(Continued on page 146)

THE TOOL ENGINEER

Segmenting Tungsten Carbide Bars in

ONLY 10 SECONDS PER CUT!

841 cuts!

735 cuts!

Almost unbelievable rim strength
of DI-MET diamond wheels gives
phenomenal performance!

DI-MET PERFORMANCE RECORD

Blade: 4" DI-MET resinoid bonded,
special type DIT cut-off
Diamond grit size: 120-150
Concentration: 100
Average end dimension of carbide
tips cut: $\frac{1}{8}$ " x $\frac{3}{8}$ "
Average cutting time per tip: 10 sec.
Surface speed of wheel: 5800 s.f.m.
Coolant used: Water (wheels flooded)
Pressure of wheel on carbide: $\frac{1}{2}$ lb.
Type of feed: Downfeed, free fall
No. of cuts—upper wheel: 841
No. of cuts—lower wheel: 735

THE high cutting speed and long life of DI-MET resinoid bonded diamond wheels in severing tungsten carbide tips from bars is well illustrated by the typical performance records at the left.

Each of these two wheels cut off $\frac{1}{8}$ " x $\frac{3}{8}$ " carbide segments from the sintered bars in approximately 10 seconds per cut and produced a total of 1576 tips before being discarded—almost twice the production experienced with any other wheel! The narrow rim width and exceptional stiffness of the steel body keeps material loss at a minimum, maintains straight, true cuts and produces smooth, polished surfaces on cut sections, eliminating subsequent, unnecessary grinding!

DI-MET resinoid bonded diamond abrasive wheels are made in all standard types and sizes up to and including 6 inches in diameter. They can be efficiently applied to cutting-off all types of tungsten carbides and for grinding carbide tipped milling cutters, reamers, broaches, single tip tools, etc.



RIM TEST—The diamond bearing rims on DI-MET wheels are the toughest, most wear-resistant resinoid bond yet produced... are capable of withstanding extremely severe abuse without cracking and chipping. Note the terrific distortion in this wheel and the high percentage of resinoid bond still retained in the rim!



OUR NEW CATALOG featuring standard DI-MET resinoid bonded wheels is just off the press... provides useful diamond wheel operating tips, includes available DI-MET wheel types and sizes, specifications and prices. Sent free on request. Write for your copy!



FELKER MANUFACTURING COMPANY

1121 BORDER AVENUE, TORRANCE, CALIFORNIA

(Continued from page 144)

al requests from aircraft builders.

After the CMP went into effect, one result was the failure of industry to place orders for steel, copper and aluminum up to the amounts authorized by CMP allotments. This practice has been labeled with the high-sounding military term 'attrition.' 'Allotment waste' probably would be a more descriptive phrase.

The WPB Aluminum and Magnesium Division records on second quarter aluminum order placement showed a 'waste' of allotments, but this was dismissed by the Claimant Agencies on the grounds that the confusion attendant on the transition to CMP operations was too great to accept such developments as facts.

When third quarter operations again showed the existence of sizable 'waste', the Aircraft Scheduling unit set out to discover the reason, Colonel Rawlings stated.

BENCH TO MACHINE SHOP

LOS ANGELES—One of the nation's most unusual machine shop workers is Municipal Judge Leo Freund, who sits on his court bench eight hours a day, then stands four hours without his alpaca robe before a screw machine at the Master Aircraft Parts plant here making bolts for bombers.

When his court closes at 4:30, he rushes home for a snack of dinner and is operating his machine by 5:30.

The judge is one of the growing number of split-shift workers who are helping solve America's war production manpower problem. How the split-shift plan works was described in the August, 1943, TOOL ENGINEER.

"Attrition is common to all war industries and does not exist solely in the aircraft industry. The aircraft industry's record of order placement is the best for almost every individual material shape allotted under the CMP. But its failure has been spotlighted by the favorable allotment treatment received from CMP officials, and by the complaints of Claimant Agencies whose allotments have been cut because of aircraft priorities," he added.

The three most important causes of allotment waste were found to be failure to meet prescribed production schedules, the heavy volume of subcontracting, and the fear psychology developed by months of acute raw material shortages. Inadequate personnel and weak material control systems also were important factors.

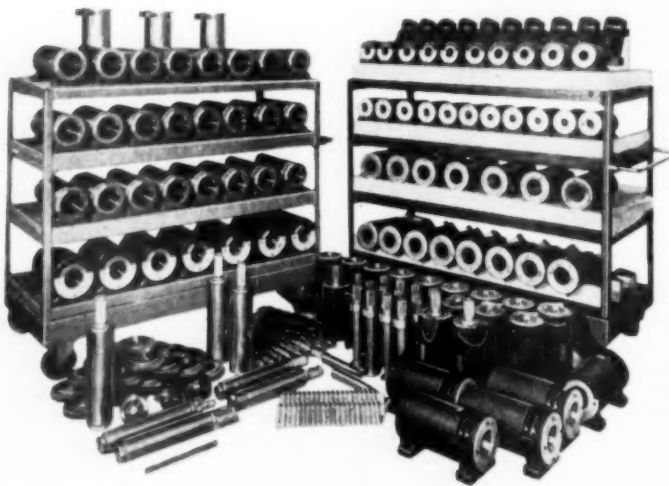
"The aircraft industry's interest, as well as ASU's, in the attrition problem is plain," Colonel Rawlings emphasized. "Preferential allotment will not continue to be received unless unpadded requests are submitted and unless orders are placed with mills equal to allotments. Pressure is being exerted now for sharp reductions in the poundages granted to ASU for distribution to the aircraft industry for the first and second quarters of 1944.

"If such developments should occur," (Continued on page 148)

Complete GAGING SYSTEMS for

CARTRIDGE CASE INSPECTION

All sizes from 30 caliber to 4.7" brass or steel cartridge cases. All required types including Maximum Profile Chamber Gages and Checking Plugs.



**SYSTEM INCLUDES
NEW GAGES
GAGE INSPECTION SERVICE
GAGE RECONDITIONING SERVICE**

*Write for Prices and
Full Details, Mentioning Your Size Requirements*



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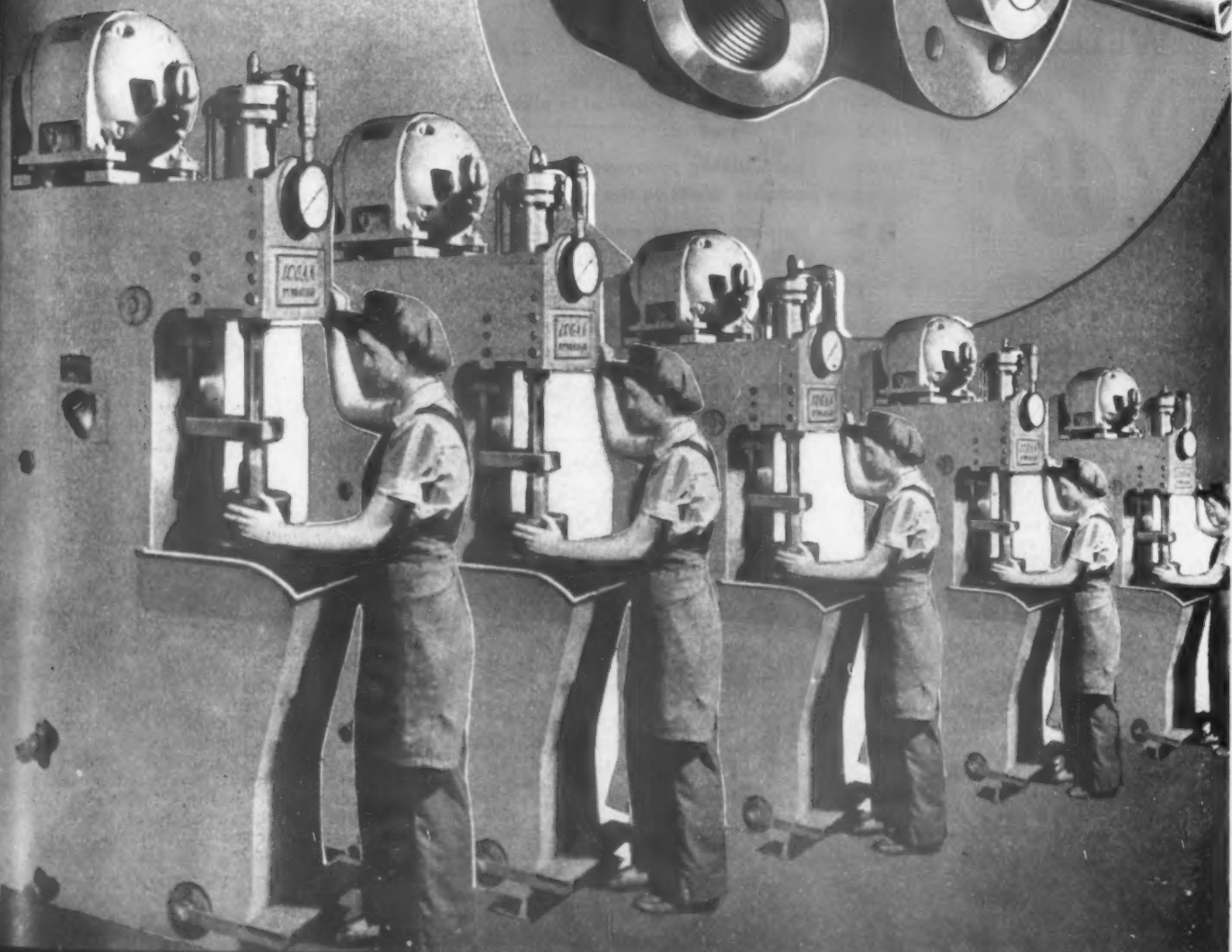
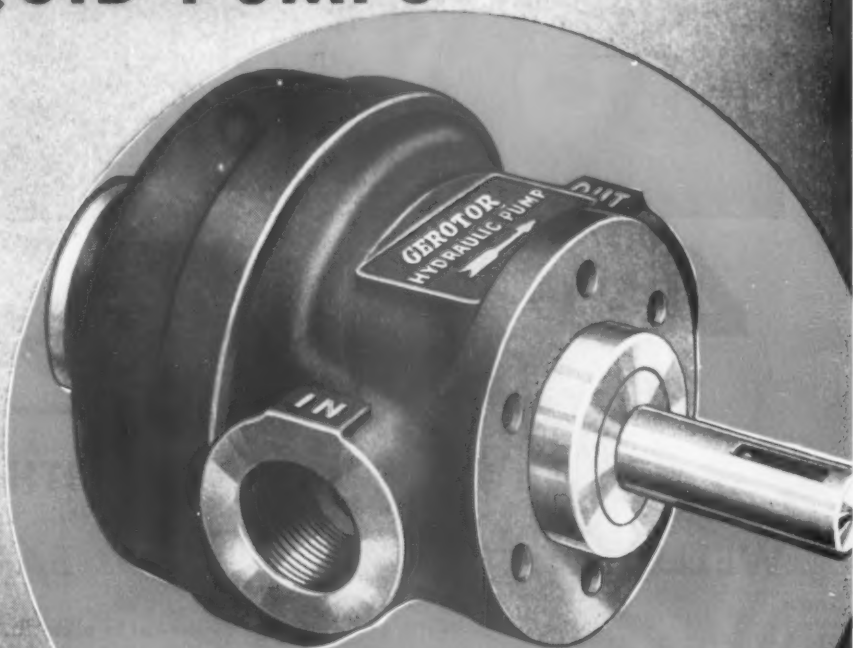
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LIQUID PUMPS

LOGAN HYDRAULIC PRESS...
another example of Gerotor's
service to the industrial field.
Behind Gerotor is a council of
skilled engineers available to
help you solve war production
problems — or to assist you in
post war planning.

May we serve you, too?

GEROTOR DIVISION
May Oil Burner Corporation
Baltimore-1, Maryland



(Continued on page 146)

certain plane makers would be hurt because ASU cannot reduce allotments below figures dictated by Bills of Materials and past performance without invoking a degree of crystal ball gazing it does not possess. A horizontal cut would be the only possible means of passing on such allotment reductions to industry."

The real solution to the problem, Colonel Rawlings stated, is adequate material control systems, which all aircraft producers realize. In the meantime, the ASU has urged each company to take inventory on hand and on order into full account in making quarterly requests for controlled materials; to check similar requests from their secondary consumers; and to make immediate return of all allotments held by themselves or their secondaries that will not be used to cover definite control material orders.

Final second quarter returns should be received at Wright Field by December 30, 1943. Form CMP-32 (ASU) "Consumers Return of Allotments" has been mailed to all aircraft prime consumers, but letters or telegrams may be used if preferred, the ASU states.

CIVILIAN TRUCKS

•WPB and Ordnance announce big production program

DETROIT—Continued speculation on a long-rumoured civilian truck production program for 1944 was ended here when the Army Ordnance Department and the War Production Board revealed that a total of 123,492 units would be produced next year.

This production will be nearly four times as great as that tentatively scheduled, but is far below figures banded in recent trade press reports.

Awarded Double-A priority on materials and Group One classification on labor, the scheduled program ranks in war production importance with aircraft. Following a meeting of government and armed force representatives with leaders of the automobile industry, Ordnance officers told the Tool Engineer Magazine that the entire program would be handled by Brigadier General John K. Christmas, Assistant Chief, Tank-Automotive Center, Detroit.

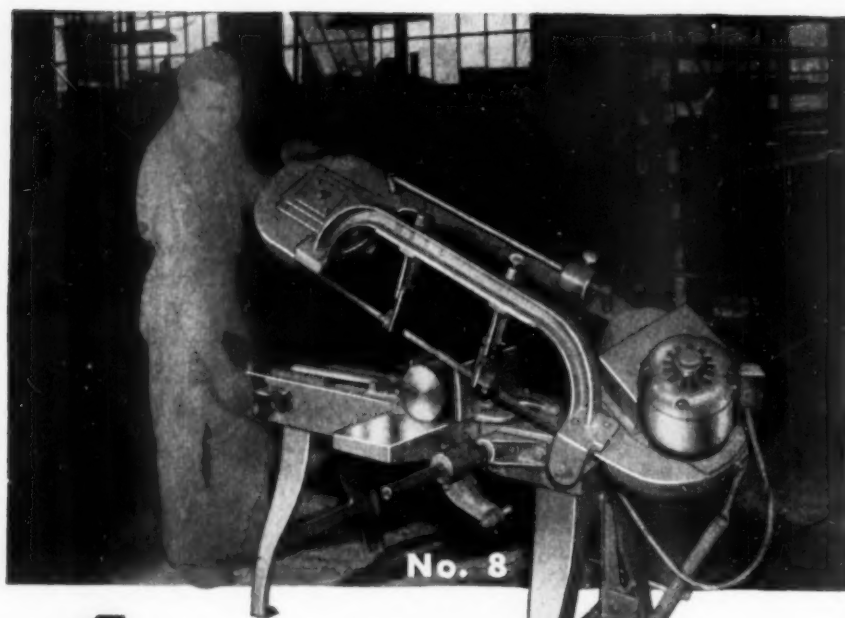
While this one agency will direct the program, from raw materials to completed trucks, it was said, expediting will be handled by the W.P.B., with other governmental agencies cooperating with the Ordnance Department. In essence, a WPB official said, the program will be the combined effort of all interested agencies.

R. L. Vaman, director of the WPB Automotive Division, said that the new program jumps projected truck production from 33,852 to 123,492 units. In comparison, normal pre-war annual production amounted to approximately 700,000 vehicles.

Concern in the automobile industry has been centered on the problem of producing axles and transmission gears necessary for the units. Scheduled production for the first six months can be handled with existing facilities, thus eliminating the necessity of procuring more machine tools and extensive new

(Concluded on page 150)

THE TOOL ENGINEER



4 WAYS TO *Conserve Manpower* WITH

WELLS METAL-CUTTING BAND SAWS

1 Use a Wells as auxiliary equipment to eliminate the bottleneck at big saws.



No. 5

2 Reduce time-wasting movement of stock—move a portable Wells to the job.



V-12

3 Save time on set-up and change-over with Wells' simple operation and quick-acting swivel vise.

4 On production cut-off jobs, use one man to operate 2 or more Wells saws.

Capacities WELLS SAWS

- No. 8—Rectangular 8" x 16"
Rounds . . . 8" dia.
- No. 5—Rectangular 5" x 10"
Rounds . . . 5" dia.
- V-12—Rectangular 12" x 16"
Rounds . . . 12" dia.
- No. 9—Throat . . . 11 1/4"
Height . . . 15"
- No. 20—Built to meet your requirements.



No. 9



No. 20

Wells Metal-Cutting Band Saws cut fast because they cut continuously. They cut most metals, including tool steels, in most any shape or form. They can be operated at three speeds—with or without coolants. Ruggedly constructed, with a minimum of moving parts, they will give long, trouble-free service.

Ask your Mill Supply dealer to show you how to save man-hours with a Wells. Send for your copy of the new Wells Catalog.

WELLS MANUFACTURING CORPORATION
**Wells METAL CUTTING
BAND SAWS**
1212 MONROE ST. • THREE RIVERS, MICHIGAN



ORDERING materials or parts by telephone from your Industrial Supply Distributor is far easier than writing the same order to the manufacturer. In these days it's better business, too.

It's *quick*—deliveries usually arrive faster. It's *convenient*—your Distributor is only seconds away. It *simplifies your job*—a

single order to the Distributor can cover many items you would have to buy separately in purchasing from the factory.

Think of your Industrial Distributor as a Supply Specialist. Take him into your planning at the start. Today and every day you'll find it pays to

Telephone your I. S. D.—first!



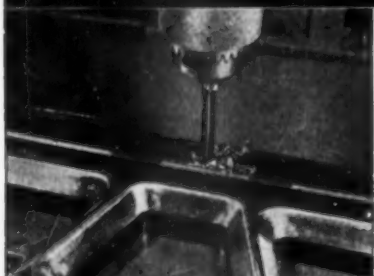
The CLEVELAND TWIST DRILL COMPANY
 1242 EAST 49TH STREET
 CLEVELAND
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES
 30 BEADE ST. NEW YORK 9 NORTH JEFFERSON ST. CHICAGO 650 HOWARD ST. SAN FRANCISCO
 4513 SECOND BLVD. DETROIT LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST. E.C.4



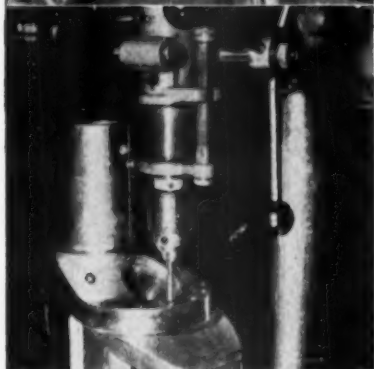
A Vital Aid

to PARTS RECOVERY—

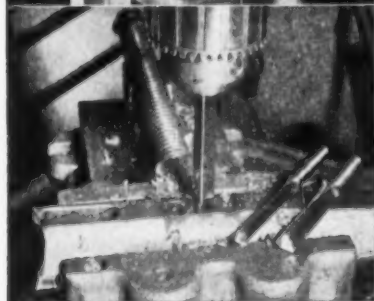
"HARDSTEEL" DRILLS



SAVES DIES. On a crimping die for making aluminum mess trays for the Navy, the diemaker forgot to drill for the gage pins before final hardening. On the stamping die he neglected to drill a vent hole before the die was hardened. All holes were drilled after hardening with "HARDSTEEL" drills and two expensive dies were saved.



SAVES MACHINED PARTS. "HARDSTEEL" drills are now regularly used to remove broken taps in blind holes in Wright engine crankshafts without defacing the threads. This method requires only 2 to 2½ hours—saves 6 hours compared with the former grinding method and results in 100% parts recovery. Hardness of the taps is Rockwell "C" 60-65.



SAVES TOOLS. This big broach broke through the slot while in service. It was full high-speed steel—yet with "HARDSTEEL" drills it was found possible to drill three half-inch holes through the shank and the broach was quickly placed back in service.

"You Harden It . . . We'll Drill It"

Parts recovery saves labor costs, machine costs and critical material. Having "HARDSTEEL" drills on hand for emergencies may mean the difference between meeting a production quota and falling behind.

No charge for "HARDSTEEL" Operator's Manual telling how to drill steels hardened by any process.

BLACK DRILL CO., 1400 East 222nd St., Cleveland 17, Ohio



"HARDSTEEL"

DRILLS • REAMERS • TOOL BITS • SPECIAL TOOLS

INDUSTRIAL NEWS DIGEST

(Concluded from page 148)

facilities, Ordnance men observed.

All of the pre-war truck builders will participate in the program, they added, and many concerns never before engaged in automobile work of this type will be involved.

The decision to push the program, Ordnance men told The TOOL ENGINEER, grew out of a recent tour of world battlefronts by Under Secretary of War Patterson and General Brehon Somervell. Their belief that the successful prosecution of the war was dependent on such a truck program resulted in its being given top priority.

It was pointed out that the over-all 1944 truck production program also includes the requirements for construction and farm machinery, general industrial equipment and other uses which may require the same general type of axles, transmissions and engines as trucks. A certain portion of the manufacturing facilities for these critical components will be reserved for the production of replacement parts for civilian use.

Trucks to be produced will consist of 92,057 mediums, ranging in gross vehicle weight from 9,000 to 15,000 pounds; 21,030 heavies, ranging in weight from 16,000 to 24,000 pounds; and 10,405 heavy trucks, ranging from 24,001 pounds up.

Possibility of such a program, the largest civilian production undertaking since industrial conversion to war work, was first mentioned in the September, 1943, Tool Engineer magazine.

INDUSTRY CALLS TOP MEN

•Wilson agrees to stay at WPB post; Batcheller to leave

WASHINGTON—Demands by industry for the return of its top management men from Washington to rebuild civilian production organizations in preparation for peacetime competition are beginning to play hobs with Donald Nelson's now smoothly running War Production Board.

The war production agency's organizational plan received a severe jolt last month when two of its top men tendered their resignations. WPB Executive Vice Chairman Charles E. Wilson, and Operations Vice Chairman Hilland Batcheller both announced plans to return to their regular jobs. The resignations were to be effective the first of the year.

Appeals from Nelson, as well as President Roosevelt, are keeping the former General Electric president in the nation's capital, but Batcheller still is expected to leave his government post soon. He, like Wilson, was immediately put under strong pressure to continue his work with WPB.

Batcheller will return to the presidency of Allegheny Ludlum Steel Corporation. He is credited today with much of the responsibility for breaking the bottleneck in steel, and the successful operation of the materials allocation plan for war production.

A luminary in the Potomac scene for the past year, Wilson is believed to be largely responsible for boosting aircraft production to the 100,000 units annually mark. He has agreed to stay until the President releases him.

THE END

THE TOOL ENGINEER

OBSOLETE MACHINES ARE

Wasteful



Increase Production, Save Manpower with

Plan-O-Mill

WAR production and post-war production suffer when obsolete machines are used. Costs are higher, manpower is wasted, output is less.

Take advantage of Plan-O-Mill's revolutionary planetary method of milling cylindrical forms, external and internal threads. *The part does not revolve!*

Today all over the Nation Plan-O-Mills are threading and forming shells, gun tubes, breech blocks, propeller hubs and other armament with a speed and accuracy previously unattained. Tomorrow — today's Plan-O-Mills will be easily converted to a host of peacetime products.

Find out about Plan-O-Mill now! Let it start saving metal, money, and manpower for you! Contact your machine tool dealer or write Dept. A.



1st to install General Electric's remarkable new Thy-mo-trol—electronic feed control!

1st planetary to mill external threads with standard multiple thread cutter!

1st planetary to coordinate feeds and speeds!

1st to provide absolute control of feed-in!

PLAN-O-MILL

CORPORATION



1511 E. EIGHT MILE ROAD • HAZEL PARK, MICHIGAN

**UP
Goes Production!
DOWN
Go Grinding Costs!**



**No Wonder Production Men
Specify This New TRU-THREAD
DIAMOND DRESSING TOOL!**

THE proof of the performance and economy of this new TRU-THREAD Diamond Dressing Tool is found in the cost and production records of users throughout the country . . . production increases in one plant up to 500% and reductions in per-piece grinding costs as much as 75%.

It's no wonder! Made with a natural fine quality uncut diamond specifically selected for the job, this tool cuts exceptionally clean. It obtains forms faster. Fewer dressings are required. Down time is reduced because more work can be ground between dressings.

The diamond is of a shape that permits angle, radial and multiple form as well as straight dressings. And because this tool can be made and re-serviced on a production basis, quick deliveries are assured.

Learn more of the advantages of TRU-THREAD TOOLS. Write or wire for detailed information today.

FOR USE ON—Excello, Jones & Lamson, Dalzen and all other thread grinding machines.

**WHEEL TRUEING
TOOL COMPANY**

3200 W. DAVISON

DETROIT 6, MICH.

**DE WALT
METAL CUTTING MACHINES**



This compact, sturdily constructed High Speed Cutting Machine for light metals (Model ME-1), will cut ferrous and non-ferrous bar stock up to 1 1/2"; light wall steel tubing up to 4" (Heavier wall tubing in non-ferrous); flat bar stock up to 1" x 4" (ferrous and non-ferrous); and extruded or small structural shapes up to 4" on a side.

Other DeWalts are:

- Foundry Metal Cutting Machine
- Tube Cutting Machine
- Wet and Dry Cutting Machine (ME-2)
- Heavy Duty Wet Cutting Machine (ME-3)
- Dual Column Metal Cutting Machine

DeWalt Builds a Complete Line of Metal Cutting Machines.

Write for descriptive literature

DE WALT PRODUCTS CORPORATION
Lancaster • Penna.

PUT IT ON THE BLANCHARD

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

Production

★ **Adaptability**

Fixture Saving

Operation Saving

Material Saving

Fine Finish

★ **Flatness**

★ **Close Limits**

★
..... Especially
valuable on jobs like
the one illustrated.

HERE are two surface grinding problems that came to the Blanchard Engineering Department in one week:

- (1) Grind a hardened steel ring $86\frac{1}{2}$ " in diameter to a tolerance of $\pm .0002$ " for thickness.
- (2) Grind the edges of a steel strip, .005" thick, .125" wide, and 20" long, straight and to a tolerance of $\pm .0005$ ".

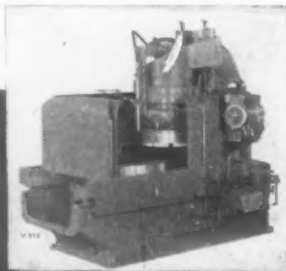
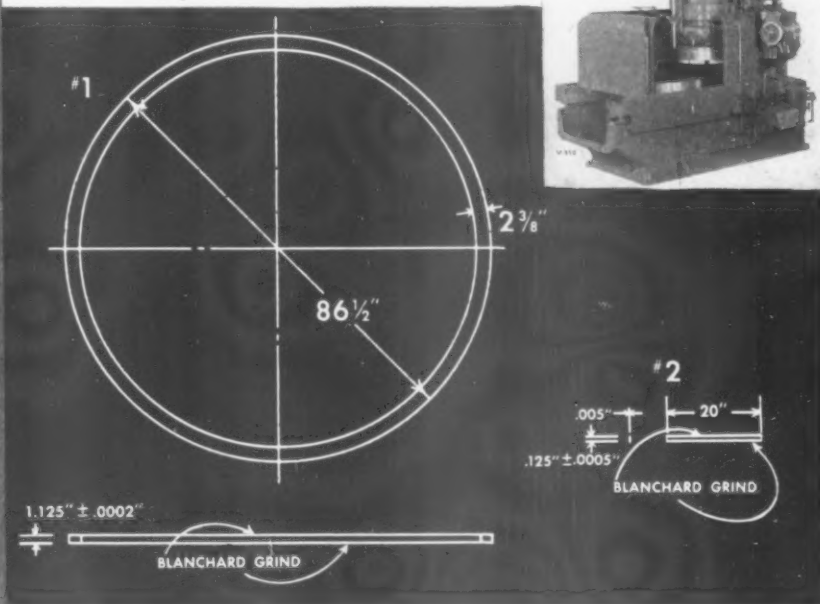
Thirty years experience in grinding flat surfaces enabled Blanchard Engineers to solve the grinding of both of these jobs, using Blanchard vertical Surface Grinders and Blanchard Grinding Wheels.

If you have work which lies within the range here indicated, you should investigate the possibilities of a Blanchard.

Whether the job is large or small, usual or unusual, Blanchard can show you how to grind it better and faster.

The **BLANCHARD**
MACHINE COMPANY
64 STATE STREET, CAMBRIDGE, MASS.

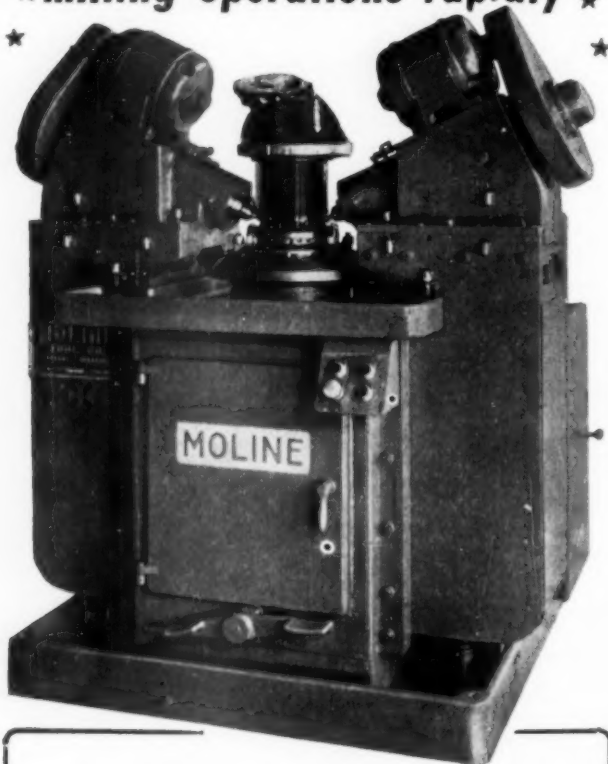
Grinding Hardened Steel Rings and Edges of Steel Strip on Blanchard Surface Grinders.



Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



★ Enables unskilled ★
★ operators to do difficult ★
★ milling operations rapidly ★



Here is another MOLINE Special Machine that is speeding up war production by enabling relatively unskilled operators to mill the spherical radii flange mounting holes of cylinders (2 at a time) for radial type aircraft engines.

In operation this No. M26 MOLINE Special Milling Machine does all its exacting operations automatically. The cylinder is positioned on 3 locating pins, is held by a foot operated expanding arbor and 2 clamps. The two diametrically opposite, individually mounted cutters are fed to position horizontally by an air cylinder operating through a toggle mechanism. The downward feed of the knees, which carry the cutter spindles, is produced by direct cam action as is the indexing and relocating for succeeding pairs of holes. The entire series of operations is carried through by automatic electric control and is protected by electric interlocking to prevent cutters from operating at the wrong time or location.



Since
1901

Builders of
Special Machinery
for Drilling, Boring,
Honing and Tapping

HELPFUL HINTS

ON SETTING UP AND RUNNING Lathes, Planers, Shapers



1—Be sure there are no chips on seating or clamping surfaces of vise, parallels or work.

2—See that tool block works freely and seats properly. Failure to do this may have serious results!

3—Don't hammer side of apron to swivel it. If edge of seating surface is dented or burred, tool box will bind.

4—Don't seat the work with a bang! Tap it into place with a babbitt hammer.

5—Never over-tighten clamps because the work may spring. Look for loose points with a "hammer tap."

6—Don't tighten vise again after seating. It may throw the work out of line.

7—Don't allow a cutting tool to project too far from tool post. "Catch it short" and clamp it tight.

8—Use wrenches of proper size, so as not to round the corners of nuts. The next fellow's wrench may slip and injure him!

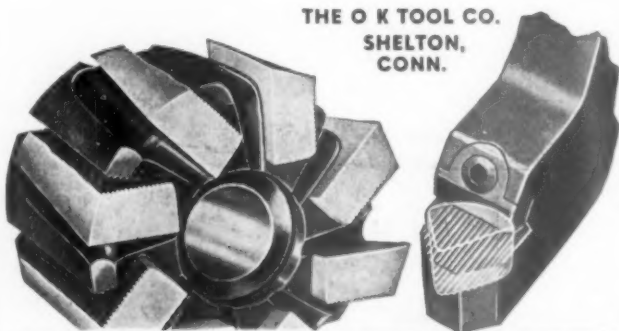
9—Use washers with all nuts, and don't use bolts that are too long (they may catch clothing) nor so short that only a few threads bear the strain.

10—Don't brush chips off a running machine. They get into the ways and destroy the bearings.

11—Don't lean on the machine with a wrench in your hand. It may slide into the moving parts!

12—Don't "heave" cutting tools onto a crowded bench. Damaged tools help to delay the day the boys come marching home!

THE O K TOOL CO.
SHELTON,
CONN.



SYSTEM

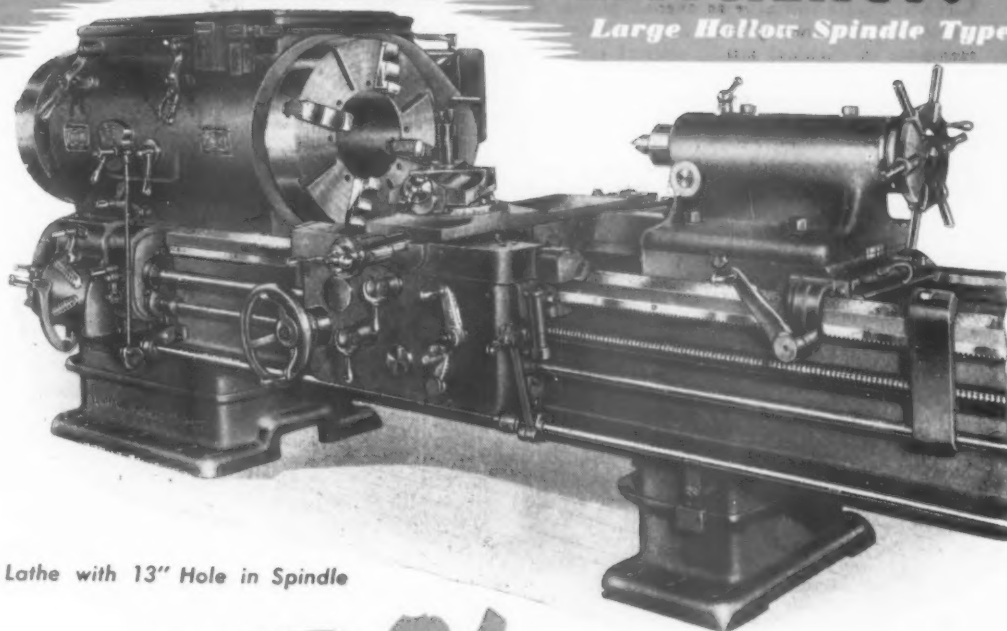
OF INSERTED-BLADE METAL CUTTING TOOLS

FIVE SIZES

(18" to 36")

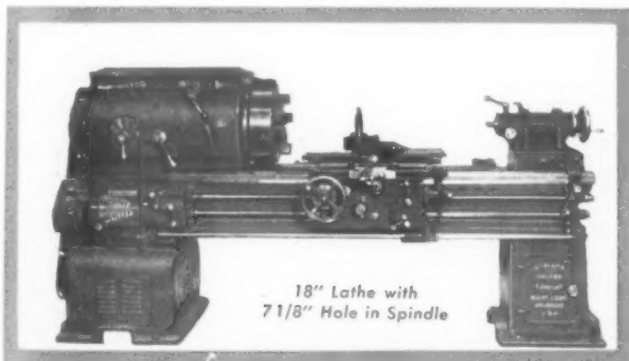
PROVIDE WIDE RANGE OF
USEFULNESS & EFFICIENCY!

Large Hollow Spindle Type



30" Heavy Duty Lathe with 13" Hole in Spindle

HYDRATROL LATHES



18" Lathe with
7 1/8" Hole in Spindle

8 Distinctive Features

- ★ Easy, Fast, Simple Operation.
- ★ Hydraulic Brakes and Clutches.
- ★ Absence of Mechanical Troubles.
- ★ Essential Operating Information Automatically Presented (on all Standard Models).
- ★ Automatic and Ample Lubrication.
- ★ Mechanism Protected by Automatic Control.
- ★ Extraordinary Hardness of Bed.
- ★ Available with Large Turrets for carriage which fully utilize the Great Power Capacity of these machines; and Beds on both ends of Headstock.

Lehmann

MACHINE COMPANY

Facts you should know ABOUT TODAY'S CHROMIUM PLATING

CHANCES are you have an over-all picture of the many virtues of chromium plating . . . its extreme hardness, resistance to chemical attack, unusual surface properties, etc., etc.

But very possibly you do not know all the ways in which these properties are being utilized in the war effort. The facts here must be extremely brief, but complete information on each application is available both to our present licensees and to any interested manufacturer. Having pioneered in the chromium plating field, United Chromium makes available the results of years of research and development—covering all the possible uses for electro-deposited chromium.



INCREASING OUTPUT OF METAL-WORKING TOOLS

Chromium increases the life of many tools, reduces stoppages and speeds output, as in the case of drawing and forming dies. Chromium plated drills cut more holes between sharpenings. On burnishing bars, chromium steps up production, produces a finer finish. These and other tools are salvaged by rebuilding with chromium.

SALVAGING PARTS AND PRODUCTION WORK

By chromium plating parts machined off-size, many plants are reclaiming rejects—saving the metal as well as man-hours represented in each piece. Successful applications include:—cylinders, pistons, axles, drive shafts, valves, ball and roller bearing parts, and many types of taps, dies, jigs, fixtures and gauges.



REDUCING WEAR ON CYLINDERS AND RINGS

Where cylinders, piston rings and other parts of internal combustion engines subjected to wear, can utilize an oil-retaining finish—chromium plating having the proper degree and depth of porosity results in greatly improved performance. Large quantities of such parts are now being processed by our licensees.

PROTECTING PRECISION OF EQUIPMENT PARTS

Where dimensional accuracy is essential to precision work, many manufacturers apply a deposit of chromium on such parts as:—feed screws, shafts, cylinders, pivots, cams, landing gear struts, etc. Chromium combines extreme hardness with a low coefficient of friction which reduces wear and prevents scoring.



U. C. TECHNICAL ADVICE ASSISTS LICENSEES TO:

- | | |
|--|---------------------------------------|
| 1. Obtain installations properly designed for specific requirements. | 4. Conserve metals and materials. |
| 2. Put installations into prompt production. | 5. Utilize manpower more efficiently. |
| 3. Meet strictest specifications. | 6. Reduce waste due to rejects. |
| | 7. Lower over-all plating costs. |

IF YOU have any questions about chromium plating in connection with your work, please write us, outlining your problem. Also send for our helpful booklet "The Last Thousandth of an Inch" containing further suggestions on how chromium plating can be used.

UNITED CHROMIUM INCORPORATED

51 East 42nd Street, New York 17, N. Y.
Waterbury, Conn. Detroit, Mich.

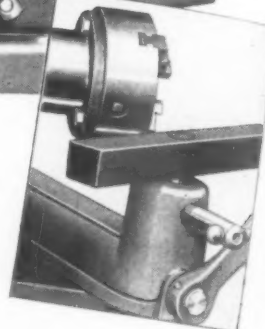
Presenting REYNOLDS New POLISHING UNIT



Illustrated here is standard Motor Driven Bench Model.

Moderately Priced.

Showing Chuck Attachment.



Reynolds New Polishing Unit offers the following outstanding features to users—

- 1" Collet capacity with 1" hollow spindle clear through.
- Uses any standard motor (not a special built-in motor).
- Has 4-step V-Belt drive.
- Speed range
 - with 1725 RPM motor—1725-900-750-600 RPM
 - with 1200 RPM motor—1200-750-600-450 RPM
 - with 3450 RPM motor—3450-1800-1500-1200 RPM
 (Note: You can purchase machine less motor and use any 1/2 H. P. motor available in your shop)
- Single lever control, starts—stops—applies brake, opens and closes collet. (Note: spindle may be stopped to inspect work without disturbing setting of piece held in collet.)
- Collets #5C Rivett: a popular size which many plants already have. This same Collet is used on South Bend 16" and 10" lathes.
- Has threaded nose spindle for use of 5" 3 jaw chuck (supplied as an extra).
- Ball bearing spindle assembly.

Write, Wire or Phone Reynolds Machinery Company, Providence, R. I., for further details.

REYNOLDS MACHINERY CO.

211 EDDY STREET

PROVIDENCE, R. I.

Three More Simple Check-Ups

THAT HELP TO KEEP CP UNIVERSALS IN CONTINUOUS SERVICE

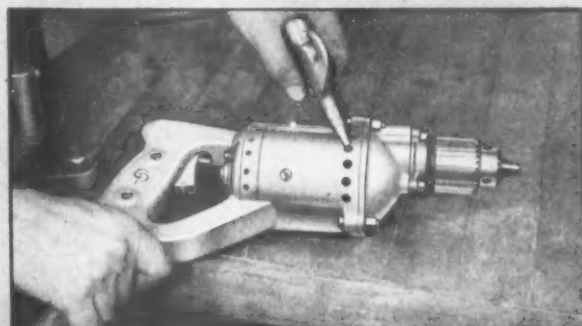


Keeping a drill, grinder, nut runner, screw driver or other CP Universal Electric Tool in continuous service is largely a matter of simple, preventive maintenance — because CP Universals are distinctly production tools, designed and built for steady, hard service. The three simple precautions illustrated on this page (and the periodic lubrication featured in a previous advertisement) will help you get maximum service from all models of CP Universal Electric Tools.

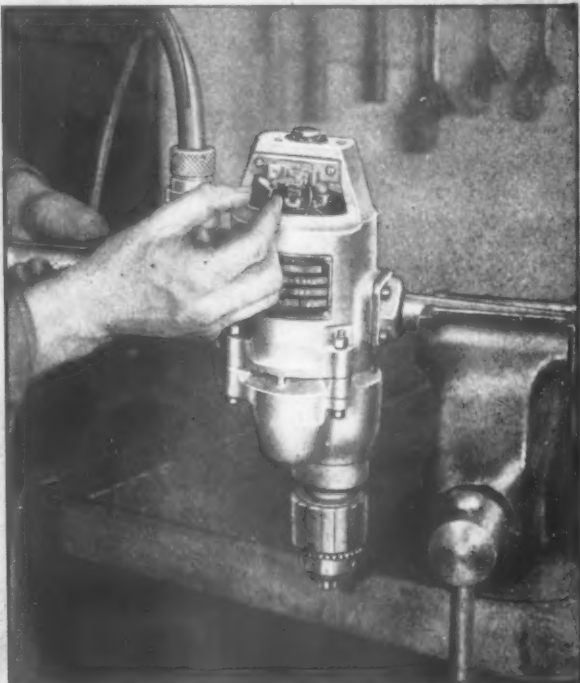
HOW TO GET MAXIMUM SERVICE FROM CP UNIVERSAL ELECTRIC TOOLS



Check all screws, bolts and nuts. Be sure they are tight before putting tool into service.



Keep ventilation openings free of dirt. They should be blown out regularly, with air hose.



Inspect brushes every 200 hours. If worn replace with CP brush, the right grade for long life of brush and commutator.

★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
(Nicycle...Universal)
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY

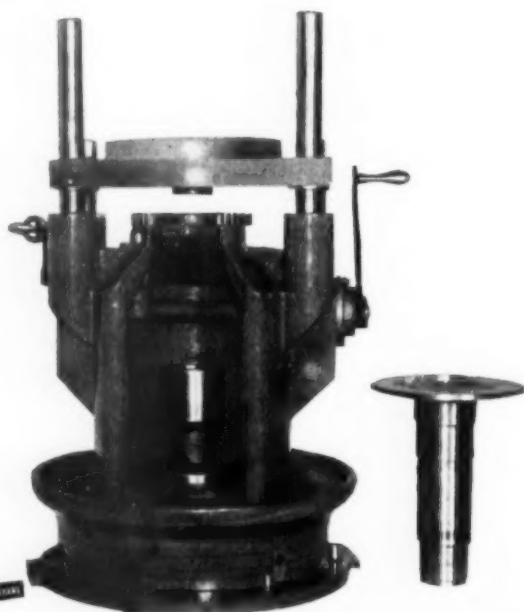
General Offices: 8 East 44th Street, New York 17, N. Y.

★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

SWARTZ TOOL PRODUCTS Co., INC.

13330 Foley Ave.

Detroit 27, Michigan



- DESIGNERS - - BUILDERS -

EQUIPPED TO HANDLE ANY
OF YOUR TOOLING
REQUIREMENTS
BUILDERS OF STANDARD
FIXTURES AND FIXTURE
LOCKS

ASK FOR CATALOG 941

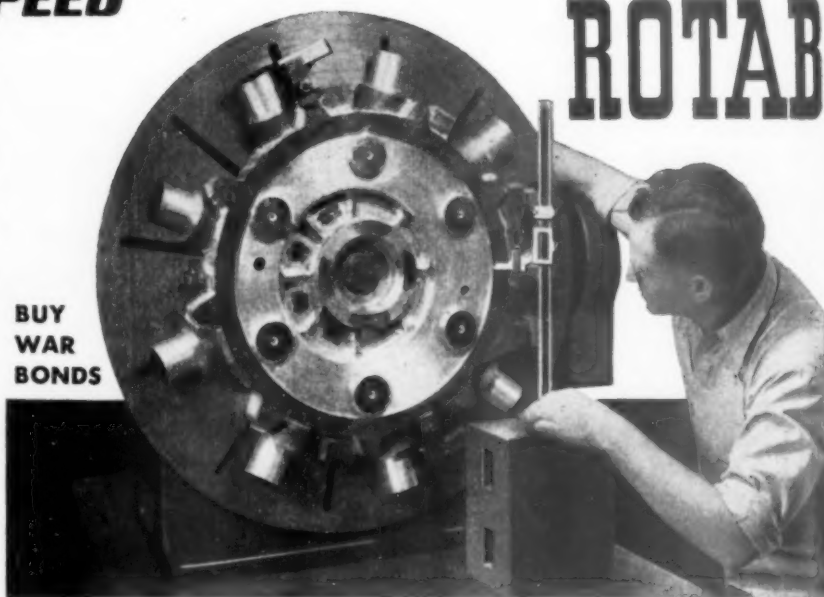
A TWO STATION INDEX FIXTURE TO DRILL A CIRCLE OF CLOSELY SPACED HOLES IN SHAFT FLANGE. LOWER ADAPTER CHANGED FOR VARIOUS LENGTH PARTS. TOP PLATE CLAMPS PART WITH STANDARD LOCK.

ANGLES OF SMALL OR LARGE CASTINGS CAN NOW BE CHECKED OR MACHINED WITH *EASE and SPEED*

The turn of a dial (graduated in degrees and minutes) will position castings or parts to any angle desired — for checking measurements or for boring or other machining operations. The rotating table to which work is fastened can be made to assume any position from vertical to horizontal, and even 30 degrees below in opposite direction.

It can be locked or be disengaged to rotate freely by hand. A 10-inch sine bar is provided for closer settings.

BUY
WAR
BONDS

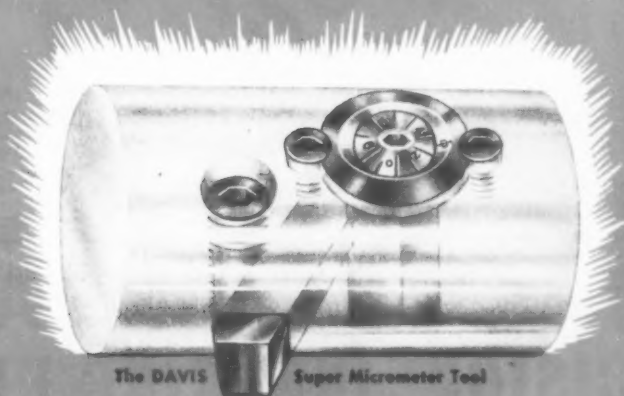


Send for folder giving complete information

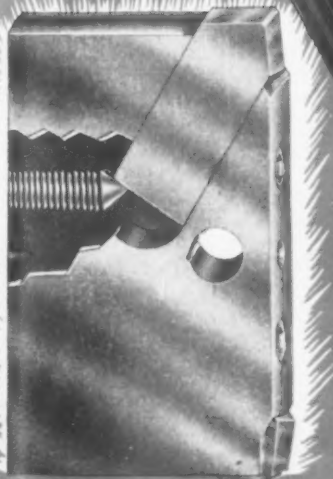
MACHINE PRODUCTS CORPORATION • 6775 EAST McNICHOLS ROAD, DETROIT 12, MICH.

THESE **DAVIS** PRECISION BORING TOOLS *Set New Records in 1943!*

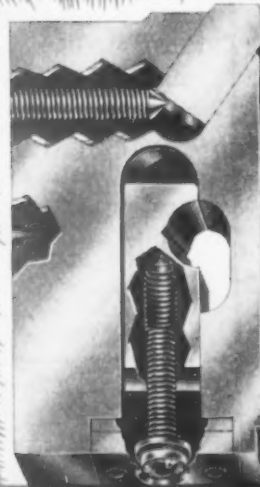
DAVIS Boring Tools have definitely helped to increase vital war production during the past year. In war plants all over the United States they have set amazing new standards for accuracy — speed — inter-changeability — economy.



The DAVIS Super Micrometer Tool



The DAVIS Regular Type Block



The DAVIS Single Cutter Micrometer Block

DAVIS BORING TOOL DIV. LARKIN PACKER CO., INC., ST. LOUIS, U.S.A.



FOR THAT *Tough*
TAPPING OR REAMING JOB!

Made To Fit Any Machine

Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.



WHEN things go wrong on some particular tapping or reaming operation, and work keeps coming through with oversize or bell-mouthed holes, don't be licked!

The main trouble probably lies in the tool holder you are using. Unless it compensates for inaccuracies in set-up as the Ziegler Holder does, faulty work is bound to be the result. So, if you have a particularly tough job, change over to the Ziegler Floating Holder. You'll be surprised at how it will smooth out your difficulties.

Besides producing better work, it also makes tools last longer. And, because of its patented feature, it always floats freely. No friction or cramping, even under the severest tool-driving strains.



W. M. Ziegler Tool Co.
1920 Twelfth St.
Detroit 16, Mich.

FLOATING HOLDER
for Taps and Reamers...

THIS UNIVERSAL PRECISION INDEXING HEAD

can be used on any
tool or surface grinder!

It holds all the tools shown at right, and can easily be adapted to hold many others. Graduated 360° in three planes, for every simple or compound angle. Vernier lever will rotate work collet between indexed points without changing index or location of tool in collet. Accurate . . . useful . . . adaptable. Prompt delivery.

Write for illustrated circular.



1. Straight shank tools up to 1" diameter are held in standard Hardinge collets.
2. No. 4 Morse taper, or conversion collet from No. 4 Morse taper to No. 9 B&S.
3. Also holds tools with No. 9 B&S taper shank.

CLEVELAND TOOL ENGINEERING CO.

1251 WEST 4TH ST.

CLEVELAND 13, OHIO

RUGGED ACCURATE BED...

Another Finer Feature of Logan Lathes



The accuracy you need for precision work is yours in a Logan Lathe, even after long continuous use. For Logan combines solid strength and Nth degree accuracy in every Logan Lathe bed. Extra heavy ribbed and warp-free, the Logan bed is machined from the finest special analysis castings obtainable. Its V ways and flat ways are precision ground to an accuracy of within .001 of an inch from end to end. This fine construction, usually found only in the highest priced lathes, is another reason why alert production men are depending more and more on Logan Lathes for low cost production of small parts.

Write today for catalog sheets giving complete specifications on all models of Logan Lathes... Quick Change Gear Types... Manufacturing Turret Lathes... Hand Screw Machines... Floor Model Back Geared Screw Cutting Lathes... Bench Model Back Geared Screw Cutting Lathes.

LOGAN ENGINEERING COMPANY

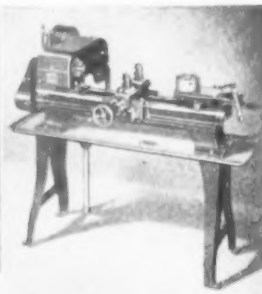
Chicago, Illinois

BRIEF SPECIFICATIONS

Swing over bed, 10½" ... bed length, 43½" ... spindle hole, 2½" ... capacity, ¾" with push type collet ... 6-position automatic indexing turret ... stroke of turret, 4¼" ... 12 spindle speeds from 30 to 1450 r.p.m. ... all moving parts protected by ball bearings or self-lubricating bronze bearings.



No. 830 — ¾" Capacity Hand Screw Machine



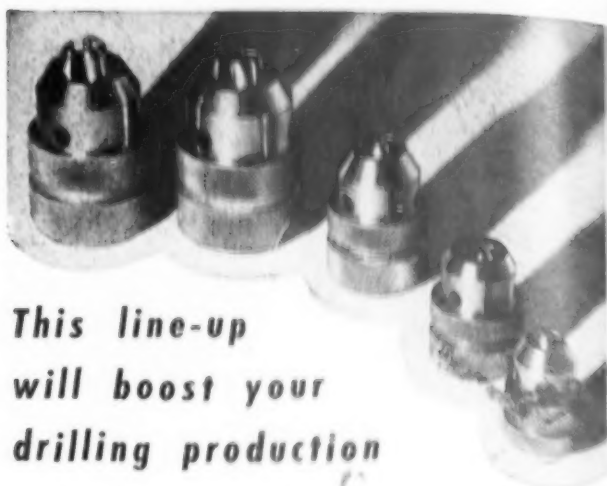
No. 850 — Manufacturing Turret Lathe



SECOMET DIAMOND WHEELS

When the war is won—Americans will enjoy higher standards of living than ever before. Motor cars, airplanes, trucks and tractors, home appliances, every machine and tool that's made of metal, will be better, safer and stronger. J.K.S. Diamond Wheels will help to make this possible by processing tougher metals, with greater precision. Air-lighted companies are already designing new products, scanning new outlets and perfecting plans for cutting their costs with improved machine tools. To such executives this is an invitation to write today to—

J. K. SAMIT & SONS
157 Chambers St., New York, N.Y. 640 Third Ave., Newark, N.J.
162



This line-up
will boost your
drilling production

—They're

Etico-Emrick KEYLESS DRILL CHUCKS

5 SIZES
for No. 2
to 3/8" drills



They'll boost your production because they eliminate the time and energy wasting key-tightening operation.

No strength is needed to set up drills. Drilling achieves the tightening—and the torque the tool the tightest they hold—ensuring a hard grip under all conditions. No damaged chucks, no time lost retightening.

Check you use Etico-Emrick Drill Chucks and see for yourself what a difference the "no key" feature makes. You'll always use them. And remember you get this valuable feature in chucks built to the highest standards of precision tool quality.

Ask for Bulletin No. 1. It gives full details. Correspondence on request.

ETICO TOOL CO.

536 Johnson Ave., Brooklyn 5, N. Y.

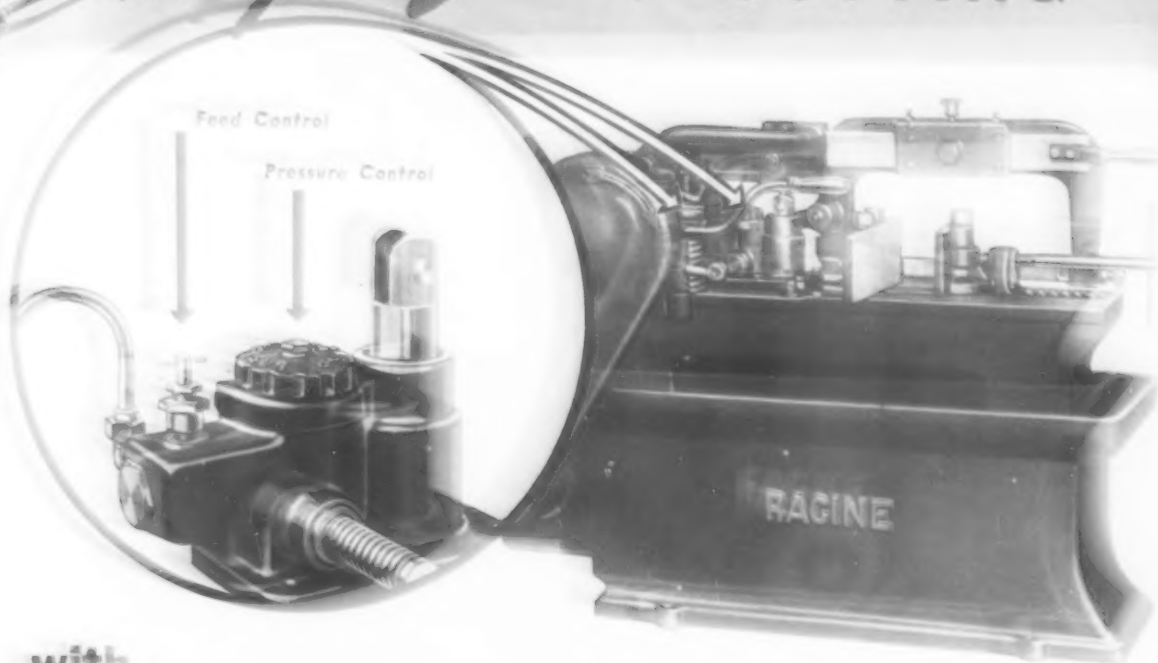
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ETICO-EMRICK DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Accuracy and Reliability

THE TOOL ENGINEER

Simplified

METAL CUTTING



with

RACINE

"UTILITY" HYDRAULIC METAL SAWS

PRECISION CONTROL OF FEED AND PRESSURE

A simple graduated dial controls blade pressure — a small throttling valve controls rate of feed. Racine Saws, because of their simple modern control devices, are easy to operate. They make the cutting of any metal from soft aluminum tubing to the hardest alloy steels — fast, easy and accurate.

Racine Metal Cutting Machines for either general purpose or high speed production are available in capacities of 6" x 6" to 20" x 20" in a wide range of prices.

Write today for complete information. Address Dept. TE-S.



RACINE OIL HYDRAULIC Variable Volume PUMPS AND FOUR-WAY VALVES

Racine "Vane Type-Variable Volume" Pumps operate at reduced horsepower. No relief or by-pass valves required. They pump only the amount of oil you need to do the job. Sizes 0-12, 20 and 30 G.P.M. at 50 to 1000 lbs. pressure per square inch.

Four-Way Oil Hydraulic Valves have Racine exclusive "Sleeve Type" construction for smooth, oil-cushioned control of hydraulic circuits. Balanced Piston cannot sag. Sizes $\frac{3}{8}$ " to $1\frac{1}{2}$ ", for either manual, mechanical or electrical operation.



RACINE TOOL and MACHINE COMPANY

Standard for Quality and Precision

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SECOMET DIAMOND WHEELS

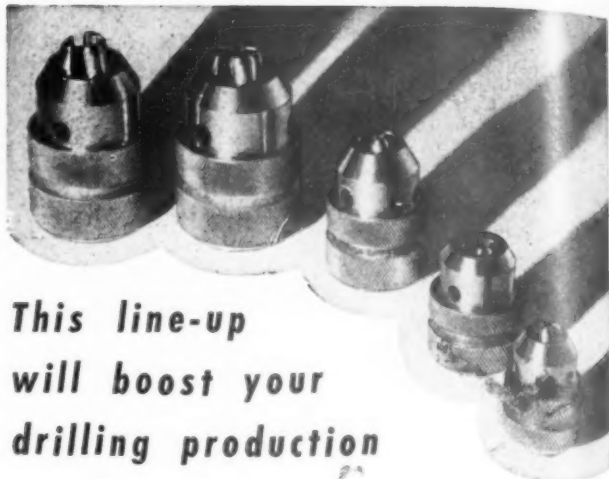
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J.K. SMIT & SONS
157 Chambers St., New York, N. Y. 6400 Tireman Ave., Detroit, Mich.



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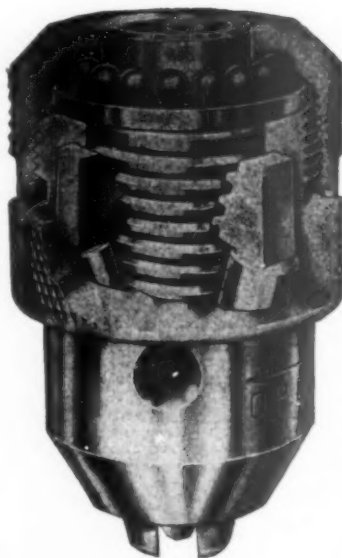


This line-up
will boost your
drilling production

—They're

5 SIZES
for No. 0
to 5/8" drills

Etico-Emrick KEYLESS DRILL CHUCKS



They'll boost your production because they eliminate the non-productive, time and energy wasting key-tightening operation.

No strength is needed to set up drills. Drilling action does the tightening—and the heavier the load the tighter they hold—assuring a non-slip grip under all conditions! No damaged shanks, no time lost retightening.

Once you use Etico-Emrick Drill Chucks and see for yourself what a difference the "no key" feature makes, you'll always use them. And remember you get this valuable feature in chucks built to the highest standards of precision tool quality.

Ask For Bulletin No. 6

It gives full details. Copy mailed to you on request.

ETTCO TOOL CO.

586 Johnson Ave., Brooklyn 6, N. Y.

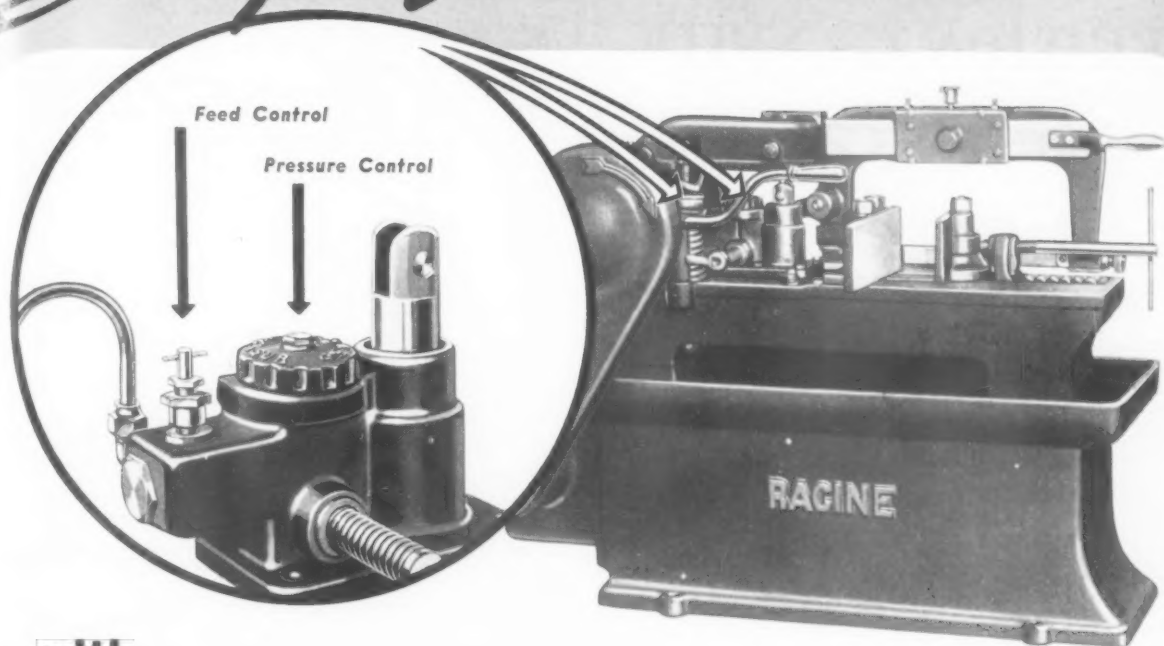
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The Famous **Etico-Emrick** DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

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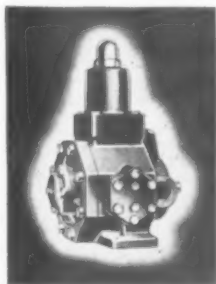
"UTILITY" HYDRAULIC METAL SAWS

PRECISION CONTROL OF FEED AND PRESSURE

A simple graduated dial controls blade pressure — a small throttling valve controls rate of feed. Racine Saws, because of their simple modern control devices, are easy to operate. They make the cutting of any metal from soft aluminum tubing to the hardest alloy steels — fast, easy and accurate.

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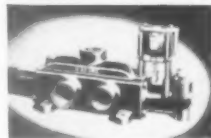
Write today for complete information. Address Dept. TE-S.



RACINE OIL HYDRAULIC Variable Volume PUMPS AND FOUR-WAY VALVES

Racine "Vane Type - Variable Volume" Pumps operate at reduced horsepower. No relief or by-pass valves required. They pump only the amount of oil you need to do the job. Sizes 0-12, 20 and 30 G.P.M. at 50 to 1000 lbs. pressure per square inch.

Four-Way Oil Hydraulic Valves have Racine exclusive "Sleeve Type" construction for smooth, oil-cushioned control of hydraulic circuits. Balanced Piston cannot sag. Sizes $\frac{3}{8}$ " to $1\frac{1}{2}$ ", for either manual, mechanical or electrical operation.



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Herman PRECISION GRANITE Surface Plates



Patent Pending

Distinctly New . . . Definitely Superior .

Herman PRECISION GRANITE Surface Plates eliminate once and for all the disadvantages and uncertainties of old-fashioned metal surface plates. Cut from solid granite, they cannot warp and will remain accurate to 1/10,000 inch overall. Practically non-porous, they do not become charged with tool damaging abrasive particles. Corrosion and rust-proof, they are as nearly indestructible as man and nature can make them. Already scores of shops throughout the country have declared them unequaled for precision work. Let Herman PRECISION GRANITE Surface Plates increase production efficiency and economy in your shop. Write today for full information.

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20" x 30" — 275 lbs.
24" x 36" — 450 lbs.

CUSTOM SIZES ON REQUEST

PRICES ARE REASONABLE

Invincible Angle Drill Attachments REACH THE SPOT!



Invincible Tools—quickly and easily attached to your portable drill—reach that "hard-to-get" spot . . . save time and expense . . . wear better—last longer . . . special thrust ball takes the wear instead of the gears.



Available from stock in three types (left to right): 90° single angle, 90° double angle, 45° single angle. Write—wire—phone Invincible today!

INVINCIBLE TOOL COMPANY

Angle Tool Attachment Manufacturers

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permit forceful effective blows without battering, scarring or marring. They protect fine finishes, delicate insulation, hardened parts and costly machinery. They far outlast other mallets, hold a true striking face and, because they absorb recoil, they are less fatiguing on continuous use operations (as pounding in winding, assembly work, etc.). Speed production—reduce spoilage. All sizes. Weighted or unweighted. Hammers take replaceable insert faces.

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Replacement insert faces for C/R Hammers sold by leading supply houses.



SPECIAL Lovejoy Milling Cutters are used exclusively at Hamilton Standard Propellers for profile milling rough forged, aluminum propeller blades. You know of the extreme precision, together with the high rate of production needed to equip our Air Force with enough—and on time! It's this ability to produce—accurately, quickly and economically—that has gained Lovejoy Cutters such an enviable place in the aircraft industry.

Are your initial "bites" at the enemy accurate, fast and economical?—if not, perhaps Lovejoy can help. Write today for catalog No. 26.

LOVEJOY TOOL CO., Inc.
Springfield, Vermont, U. S. A.

AN INITIAL "BITE" AT THE ENEMY...

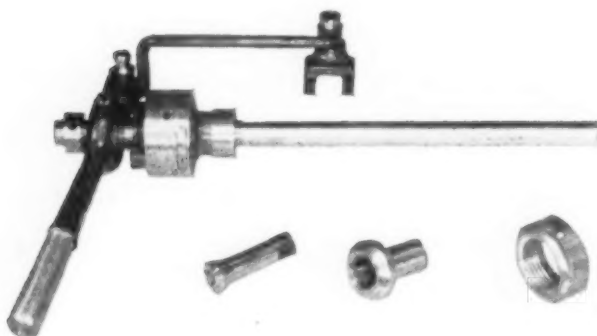


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Here Is Another Unsurpassed Machine Tool

from **Crozier** Craftsmen

This heavy-duty collet closing attachment is typical of Crozier leadership. Improved design originated by Crozier-craftsmen years ago. Has often been imitated, it has not been equalled. Adapted to standard and 1-A, 3-C or 3-SB collets.

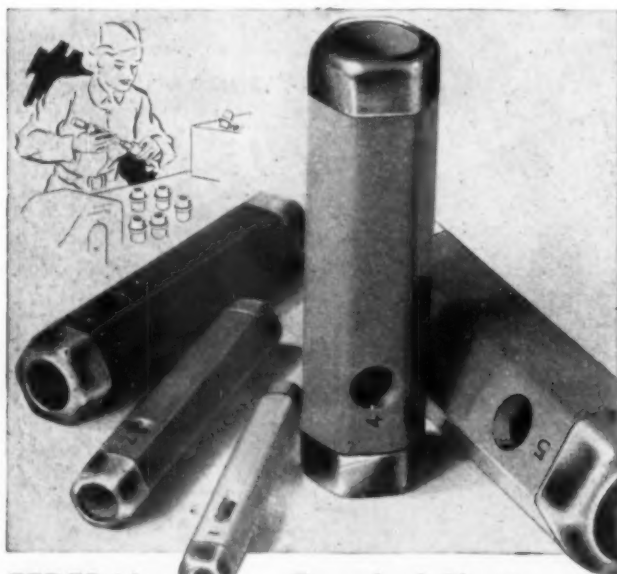


A Collet Closing Attachment

Ideal for second operation work. Converts Atlas, Logan, South Bend and other small lathes to high production units. Allows changing stock while spindle is running. Precision construction. Trouble free. One-half inch capacity—\$65. Other sizes priced in proportion. Send today for complete information.

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Federal Plastic Gage Handles give gages a more sensitive touch because they are lighter than any metal. They reduce fatigue and insulate from body heat, safe-guarding accuracy. **Marked** for identification with the same stamps used for marking metal handles. **Ideal** for Glass Gages which require Handles of light weight for best results, reducing danger of breakage as well as adding to sensitivity. **Available** in seven standard sizes and in **colors**—Red, Yellow, Green and Black for easy identification. **New** low prices represent a real saving. **Now available for smaller gages—size 00 in same colors.**

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402 North Leavitt St. CHICAGO 12, ILLINOIS

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18 WAYS TO SAVE TIME & MONEY!

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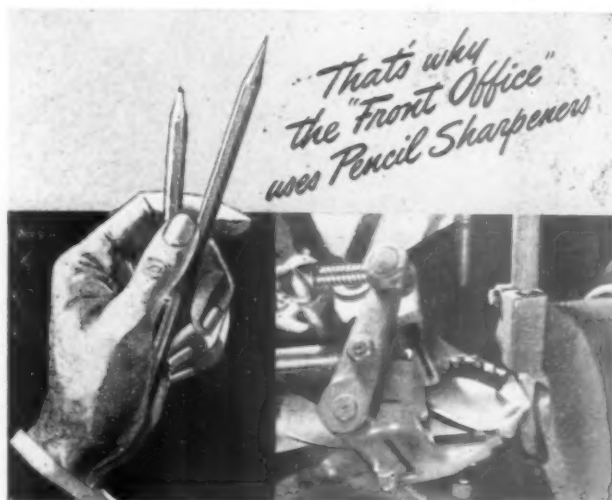
Mead Industrial Burring Machine



FOR METAL - PLASTIC - WOOD

New circular explains, illustrates 18 ways in which the Mead Industrial Burring Machine saves time and money—also contains special Grit Guide. Every industrial plant needs this "Jack-Of-All-Trades" machine. Your burring can be done in "free time"—install these machines by every machine tool which leaves burrs. Grinds, finishes both outside and inside cut-out openings. Immediate delivery in most cases. Write for the informative Money-Saving circular now.

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It's a quicker, more accurate, less wasteful way of doing the job. And for those same good reasons modern tool rooms are equipped with

The SELLERS DRILL GRINDER

This method of grinding automatically produces the scientifically correct drill point required for precision work. Angles of inclination are equal, contour of lips is identical, resulting in a point that drills true cylindrical holes faster with more holes per grind. Inexperienced girls are quickly trained to turn out a constant supply of perfect drill points, reducing both your drill inventory and drilling costs.

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SELLERS

PRECISIONEERING SINCE 1848

THE TOOL ENGINEER



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Throughout the Nation, business, home and public organizations are bending every effort to gather scrap for salvaging—but, are you scrapping *your* High Speed Tools before they have served for their maximum amount of production?

By having your cutters reconditioned, or converted into special tools, you are not only conserving the vital steel required to produce them, but are also saving the man-hours necessary to manufacture them—in unnecessarily overloading the tool producing facilities of tool manufacturers throughout the country.

● *Tool cost can be cut 50%, and delivery expedited to a matter of days instead of months.*



● *Why not call on us to give you some of our 30 years of tool experience. There is no obligation.*

A COMPLETE RECONDITIONING SERVICE FOR TOOLS

NEW MILLING CUTTERS FROM OUR STOCK OR YOUR OWN STANDARD CUTTERS
CAN BE QUICKLY CONVERTED TO SPECIAL CUTTERS



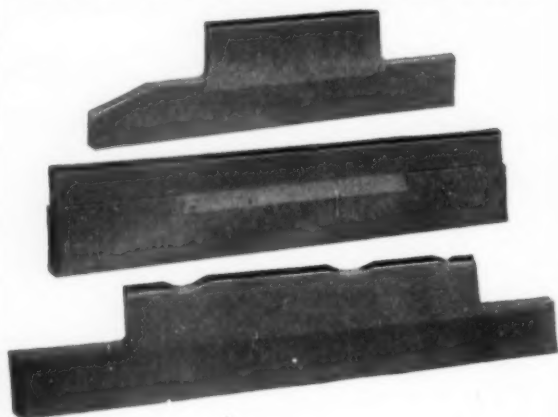
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30-32 Littleton Ave., Newark, N. J.



Chrome Plant **MASTER CHROME SERVICE** INC., 5709 Herman Ave., N. W., Cleveland, Ohio

TIP YOUR G. G. BLADES with WILLEY'S METAL



Centerless grinder work support blades tipped with WILLEY'S METAL give greater production, provide continuing accuracy, eliminate down time. They outlast ordinary rest blades many times. Send in your old, worn blades to be re-tipped. Estimates furnished promptly on receipt of blades. We also design and build special cutting tools to meet your needs. Send prints for quotation.

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1340 W. Vernor Highway, Detroit, Michigan

COLBORNE



*Speed
Lathes*
**SPEED UP
PRODUCTION**

USED FOR FINAL FINISHING
OPERATIONS

ECONOMICAL POLISHING
LAPPING, BURRING,
BURNISHING, FINISHING

OF
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SHAFTS
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GAGES
BALL RACES
SMALL PARTS
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Built to meet the requirements of those desiring a heavily constructed, smooth running machine of highest quality.

Has motor in base with variable speed control, using REEVES standard pulley and belt.

Smooth automatic brake acts instantly when switch is thrown. Collets or chuck may be used.

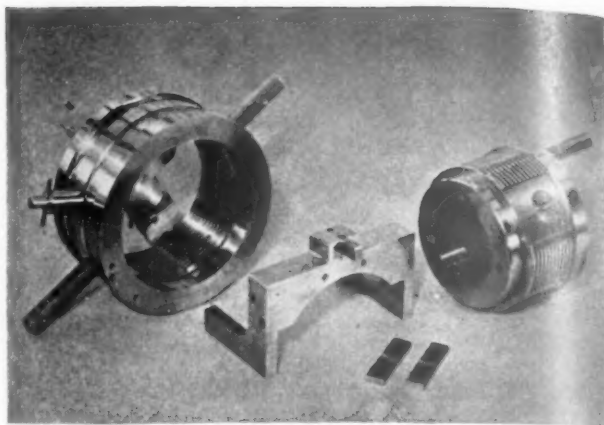


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*** With facilities unexcelled in the Central States, we are prepared to undertake a complete production tooling job or to design and manufacture any special gage or fixture required. Standard, plain and threaded, plug and ring gages shipped promptly from stock. Write for new literature, just off the press.

MERZ *Engineering Company*
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- FASTER PRODUCTION
- BIGGER TIME SAVINGS
- BETTER WORK



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Brightboy "rubber cushioning", a proved principle in metal finishing, has enabled many industries to set their production sights higher. Brightboy abrasive and the resilient rubber binder into which it is impregnated, represent a combination that de-burrs, finishes and polishes in a single operation. Bridges the gap between a grind and a buff. Degree of finish is achieved by regulating the machine speed; in manual operations by hand pressure. Get BRIGHTBOY METHODS AND APPLICATIONS, an attractive booklet, and prices from your distributor or from us. Brightboy field men are at your service.

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Weldon Roberts Rubber Co. Newark, N. J.



THE TOOL ENGINEER



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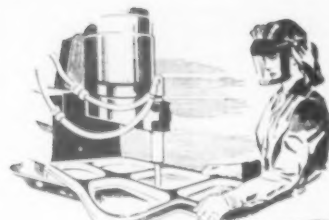
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Cool, clean air protects the life of the wounded in Army hospitals. Special aircraft refrigerators safeguard serums and plasma.



Aluminum
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Peak welding efficiency is made possible by cooling of welding tips with water or brine held at the right temperature.



Spot Welder
Tip Cooling Unit



Tool life is increased and rejections are fewer when cutting oils used in high-speed machining are properly cooled.



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The health of our armed forces is protected by dependable refrigeration in cantonments, huts, barracks, and on ships.



14 Cylinder
Refrigerating Compressor



Super accuracy in gauge rooms is possible when the air is clean, dehumidified, and maintained at a constant temperature.



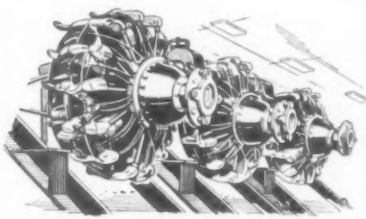
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Air Conditioner



Protection in the tropics against the ravages of humid atmosphere and vermin is necessary to preserve food and equipment.



Portable Panel
Refrigeration Unit



Identical performance of aircraft engines is assured by operation tests with carburetor air kept at the same temperature.



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Clean, dry atmosphere is vital for machining sensitive metal surfaces where a spot of rust would ruin high-precision products.



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★ CHRYSLER AIRTEMP AT WAR ★



From tiny, fractional horsepower to big 75 horsepower units, Chrysler Airtemp Radial Compressors are performing a major war job on both the production and battle fronts.

The science of air control is built around the compressor. Chrysler Airtemp's exclusive Variable Capacity Radial Compressor provides a new efficiency and accuracy in indoor climate regulation. The radial cylinders cut in or out automatically, one at a time, to meet varying load requirements. This flexibility eliminates the peaks and valleys resulting from abrupt starting and stopping of ordinary compressors... holds temperature and humidity at a constant level.

Years spent in building delicate mechanisms, have developed high-precision, versatile skills at Airtemp, now devoted to war production. Backed by Chrysler Corporation research and engineering, when peace comes, these skills will again create heating, cooling and refrigeration units for homes and commercial use that will set new, high standards of efficiency and performance.

The lessons learned during peace in free competitive enterprise—freedom of the individual to produce and compete—today bring strength to a nation at war.

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Tanks • Tank Engines • Navy Anti-Aircraft Guns • Army Anti-Aircraft Guns • Bomber Fuselage Sections • Bomber Wings • Bomb Racks • Bomb Shackles • Fighter Landing Gears • Aluminum Alloy Forgings • Aluminum Alloy Castings • High-Powered Aircraft Engines • Cycleweld Cement • Wide Variety of Ammunition • Anti-Tank Vehicles • Command Reconnaissance Cars • Troop and Cargo Motor Transports • Ambulances • Weapons Carriers • Gyro-Compasses • Navy Pontoons • Marine Tractors • Harbor Tugs • Marine and Industrial Engines • Smoke Screen Generators • Air Raid Sirens and Fire Fighting Equipment • Powdered Metal Parts • Cantonment Furnaces • Tent Heaters • Refrigeration Compressors • Field Kitchens • and Other Important War Equipment

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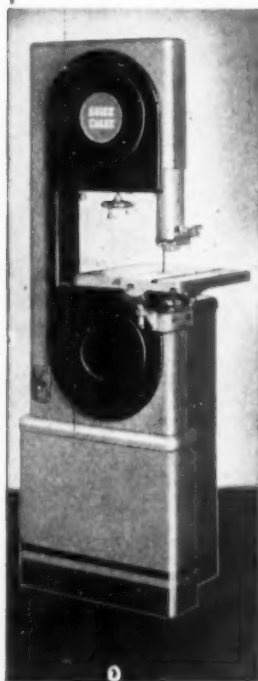
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BACK THE ATTACK—BUY WAR BONDS

GET BIG PRODUCTION FROM UNSKILLED WORKERS!
Every dollar invested in
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SAFETY ENGINEERED
PRECISION BUILT
SHOP TESTED
does the work of two spent on oversize machines.
You can get **QUICK DELIVERY** from Boice-Crane

**LOOK AT THEM ALL
AND YOU'LL BUY A**

Boice - Crane Model 2300, 14" Steel Clad Band Saw



Cuts metal, wood, plastic and paper stock up to $8\frac{5}{8}$ " thick and 27" in diameter.

Strong, light wheels effect exceptionally quiet, vibrationless operation.

Wheel guard swings on hinges and must be closed before machine can be operated.

Telescoping blade guard holds by friction when lock handle is released. It will not drop while adjusting.

Tool and die makers appreciate the new blade guide design which handles blades from $\frac{1}{8}$ " to $\frac{3}{4}$ " and is conveniently adjustable by single knob control.

The 15" x 15 $\frac{1}{2}$ " table is rigidly supported on two large trunnions. No portion can sag under heavy cuts. Tilts 45° to right, 10° to left, degree of tilt indicated by convenient scale.

8 efficient speeds, one for every kind of blade and material.

Heavy duty gears transmit as much as one horse power at lowest speed with a wide margin of safety. All gears run in oil.

On floor model all moving parts, including motor, are fully enclosed and sealed against dust and grime. Given top rating by State Safety Commissions.

Also available in bench model.

A battery of 6 to 10 Boice-Crane Saws cost no more than some single machines of big size.

BOICE - CRANE OSCILLATING SPINDLE SANDER



Rapid production. Uses smallest diameter abrasive sleeve of any low priced spindle sander. Sands any degree of bevel up to 6 inches in height. Large, tilting work table.

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Accurate, rugged, long-lasting HY-PRO Taps are packed in sturdy boxes separated in trays to protect their precision threads. Package acts as miniature tool box. Complete description on colored labels give exact contents of box for immediate identification and accurate stock keeping.

Send for illustrated catalog on company letterhead.

HY-PRO TOOL CO.
New Bedford, Mass., U.S.A.

465 Mt. Pleasant Street

PRECISION LAPPING



of thread and other gages in the plant of Bausch & Lomb Optical Company. Machine used for this delicate job is a Schauer Variable Speed Lathe—modified to permit the operator to reverse the directional rotation of the spindle quickly, so that the lapping tool will move back and forth across the face of the gage, thus eliminating the necessity of raising the lapping tool from

the work each time the tool has traveled the length of the thread.

Magnetic reversing switch, foot lever controlled, leaves both hands of the operator free for the work, and materially increases output.

SCHAUER IDEAL SPEED LATHES

speed polishing, grinding, de-burring, finishing and lapping of small metal and plastics parts. There is a type and size for every purpose. Write for Catalog No. 420.



Schauer ORIGINATORS OF TODAY'S
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MACHINE COMPANY
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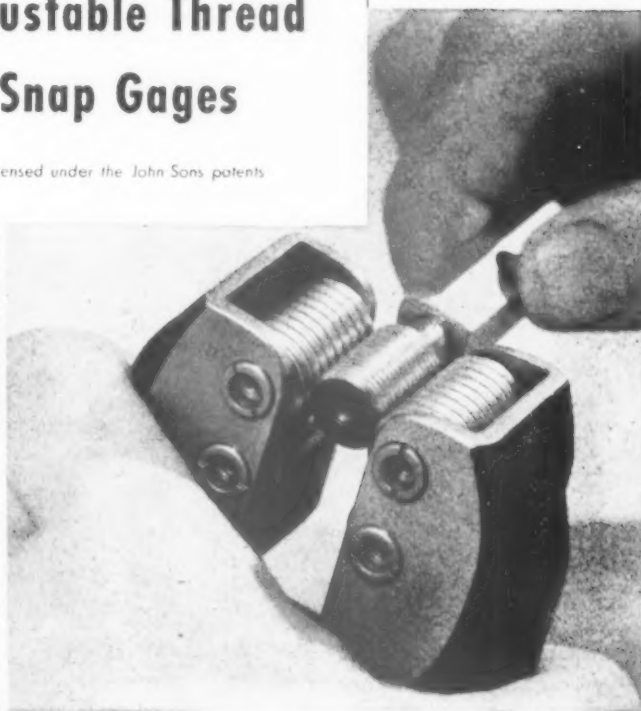
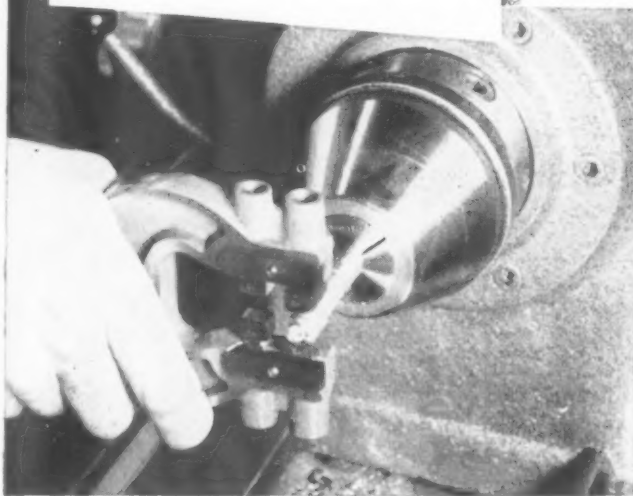
THE TOOL ENGINEER

TAFT-PEIRCE *Announces*



A COMPLETE LINE OF Roll Thread* AND Adjustable Thread Snap Gages

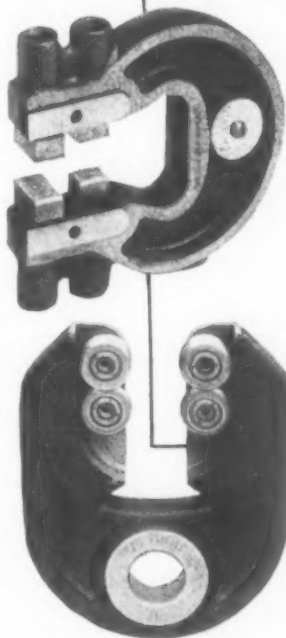
*Licensed under the John Sons patents



TAFT-PEIRCE is proud to announce the addition to its well-known Adjustable Thread Snap Gage line of a full line of *Roll Thread* Snap Gages, manufactured under the John-Sons patents. Thereby Taft-Peirce follows its established policy of providing a *complete* line of gages for every gaging preference and purpose.

The speed and convenience afforded by the use of thread snap gages for the external gaging of screw threads has established the soundness of the snap gage principle for the overwhelming majority of thread gaging applications. Each of the two well known types of thread snap gages—the roll thread type and the adjustable type—has its advantages and its own adherents. Both types have been proven through more than a decade of practical use in industry to be accurate and effective.

Taft-Peirce gage engineers are prepared to recommend the type best suited, in their judgment, to your problem, or will furnish either, according to your own preference. Write for new illustrated bulletin on the *complete* Taft-Peirce line of Thread Snap Gages.



Taft-Peirce Style 9432 Adjustable Thread Snap Gages, shown at left, and in use at left above, are available in sizes from $\frac{1}{4}$ to 4" in any pitch desired. This style of gage is adjustable over a range varying from $\frac{1}{4}$ " to $\frac{1}{2}$ ", depending on size.

Taft-Peirce Style 9435 Roll Thread Snap Gages are made in 2 styles. Shown in use, above right, is the closed-face type for general work. Directly at the left is the open-face type for use where the thread runs up to a shoulder.



The TAFT-PEIRCE

MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

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Form Tools



assure **GREATER ACCURACY** **FEWER REJECTS!**

Inaccuracy means rejects, and rejects mean waste. But, if your form tools are **ACCURATE**, the parts or products machined from them will be accurate, too. Time and materials are precious. You can't afford to waste either. So, our engineering staff is at your service to design form tools to meet your specific needs — dovetail or circular, accurate to .0001, in any quantity to meet your own production schedule.

ELECTRIX *precision is a matter of record in important ordnance centers!* In addition to form tools, we make precision gages of 33 types, jigs, fixtures, molds and special tools.

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Versatile . . .

In Construction . . In Application

THE NORTON UNIVERSAL MULTIPURPOSE GRINDER finds its particular field of utility in miscellaneous, small-lot general production or in tool room work. Its standard equipment gives it a versatility to handle a diversity of work without difficulty of set-up or wastage of production time.

Its construction is such that it has a long life of accurate and rapid production. The massive base has maximum stability and lends rigidity to the various units when grinding capacity work. The headstock and footstock are self-contained and may be moved to any desired point on the flat-topped table.

Controls are concentrated within easy arm's length of the operator's position, from which point also most of the machine adjustments and inspections of operating and lubricating functions may be made. This contributes materially toward operator comfort, minimizing fatigue.

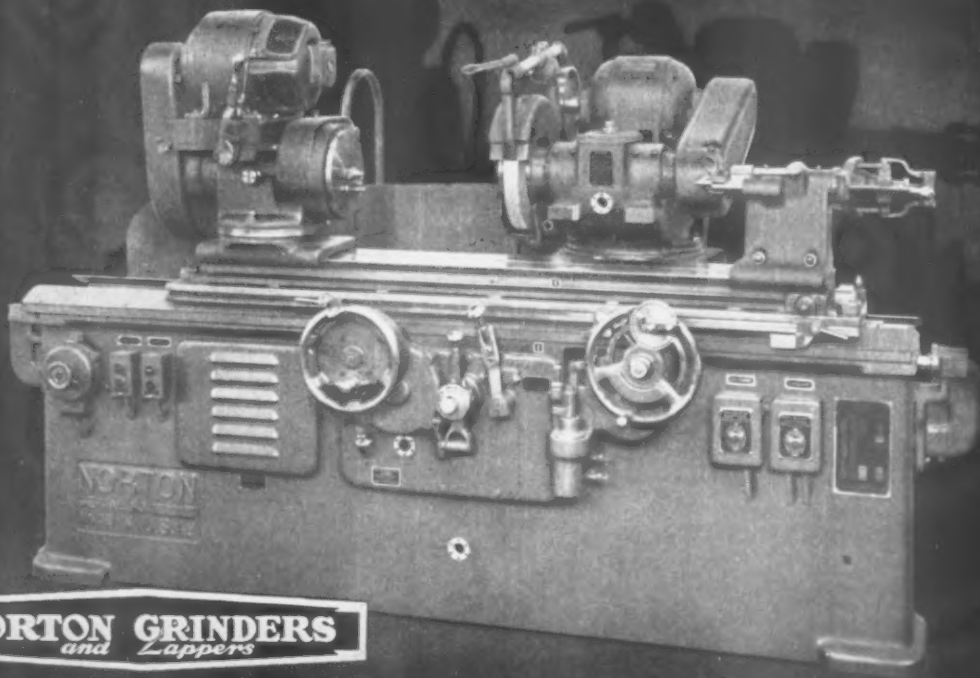
A new pictorial folder on the Norton Multipurpose Grinder will be sent on request.

NORTON COMPANY

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New York - Chicago - Detroit - Cleveland - Hartford

M-473



NORTON GRINDERS
and Lappers



BUSHINGS

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TALIDE METAL..

Tools, Dies and Wear Parts

Tipped with **TUNGSTEN CARBIDE** are keeping war plants in constant, uninterrupted production, with the added advantages of . . .

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- * Increased Output
- * Maintained Size
- * Closer Tolerance
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helping to complete vital War Contracts on time.

TALIDE TUNGSTEN CARBIDE Bar Stock is available in any size, diameter and length . . . for application to surfaces where wear and abrasion are troublesome.

Full Engineering Information on Request

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YOUNGSTOWN, OHIO
TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

USE THE

COTTA SPEED- CHUCK



FOR INCREASED GEAR PRODUCTION AND GREATER ACCURACY . . .

For operations where gears are to be chucked for hole or face grinding, or for boring or turning, the COTTA SPEED-CHUCK offers opportunities for substantial production economies and improvement in accuracy. The gear is held precisely centered with reference to its own pitch line, thus automatically eliminating errors caused by eccentricity. There are no levers, screws, or other clamping devices to operate, as the gear is gripped firmly against the direction of rotation by hardened pitch-line pins bearing on a set of accurately ground fixed cams. COTTA SPEED-CHUCKS are made to specifications for spur, helical, and step or cluster gears. Send print of gear for quotation.

CHARLES COTTA

1712 HARLEM • ROCKFORD, ILLINOIS

a key to
this lad's
future . . .



James Threadwell taps are an important key to the solid manufacture and assembly of the implements of war, so in years to come they will be the key to the mass production of cars, planes, radios and dozens of other implements of peace which will raise the standard of living for every youngster now toting his books to and from school. Ask your Threadwell distributor to explain why Threadwell taps are the way better.

EXPORTING DISTRIBUTORS
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British Die Makers Ltd., London



* THREADWELL TAP AND DIE COMPANY, GREENFIELD, MASS. *

Amazing S-22 Synthetic ETCHING STAMPS

Thousands of our new "S-22" Synthetic stamps now in service have proved that this new material outlasts rubber or other synthetics by from 3 to 4 times, when used with acid etching inks. Order "S-22" next time you need inspection stamps.



INSPECTOR'S KIT

Made of acid proof, non-critical material, this new Kit holds stamps, etching ink, ink pad and neutralizer. Inexpensive, compact and convenient. Write for quotation.

Write for Bulletin S-- Catalog 146

This valuable bulletin illustrates the various styles of stamps available. Write for your copy today.

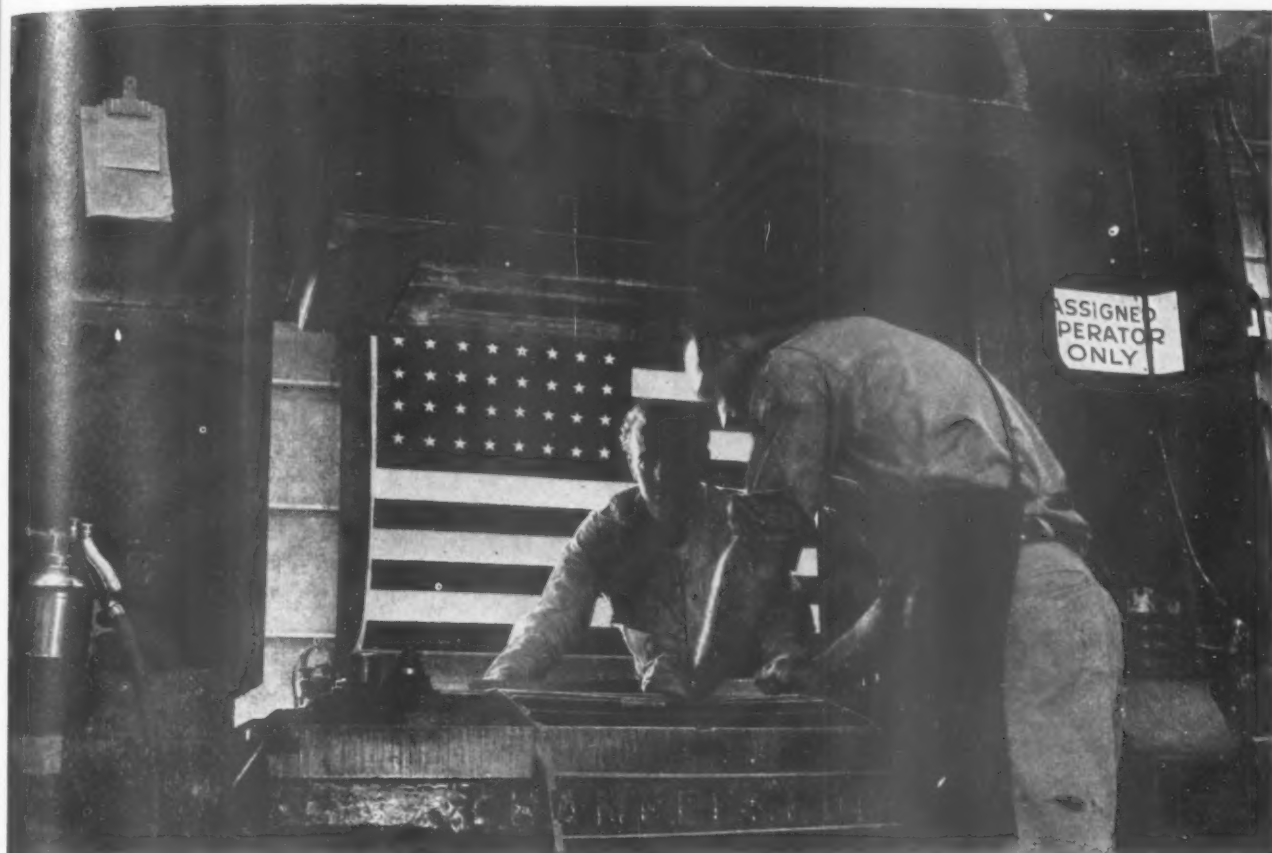
JAS. H. MATTHEWS & CO.



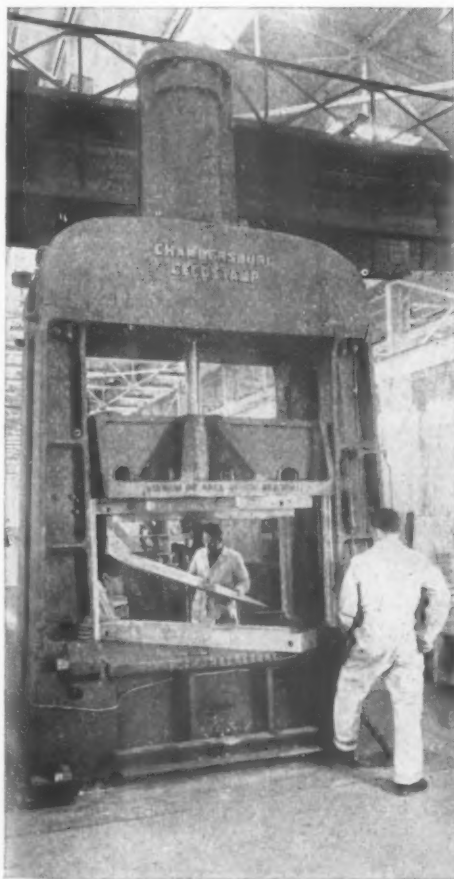
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THE TOOL ENGINEER



THE CECOSTAMP SOLVES NEW METAL FORMING PROBLEMS



THE newer sheet metal forming problems posed by the needs of the aircraft industry included the need for a means of forming tougher, more elastic alloy sheets in clear-cut die impressions without tearing, wrinkling or reduction of section, to accurate limits without mismatching, and of speeding the production of these badly needed parts.

The Cecostamp was designed by Chambersburg to meet and solve these problems. How well it has done so is indicated by the fact that practically every aircraft manufacturer in the United States, and many of the most important ones in the countries of our Allies, are using Cecostamps for the production of alloy sheet metal parts.

And while wartime production is now absorbing all the Cecostamps that can be built, it is evident that their adaptability to peacetime production will disclose further possibilities of wider application.

CHAMBERSBURG ENGINEERING CO. • CHAMBERSBURG, PENNA.



**CHAMBERSBURG
CECOSTAMP**

from simplest
DIES
to most exacting

GAUGES — TOOLS — FIXTURES
JIGS — SPECIAL MACHINES
DESIGNING & ENGINEERING
HIGH PRODUCTION STAMPING

BARTH STAMPING & MACHINE WORKS

Die & Tool Makers

W. 34th and Denison

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Magni-Ray



The new illuminated magnifier will aid in solving your inspection problems. Used for inspection and examining work for burrs, flaws in workmanship, surface defects, cracks in castings, blow holes, imperfect welding seams. Light shines on work, no reflection in eyes of operator. SPEED-UP INSPECTION WITH MAGNI-RAY.

INVESTIGATE!

Wherever you now use ordinary magnifiers, try the ILLUMINATED MAGNI-RAY, and compare results. Write today for folder describing both models.

MADE IN 2 MODELS

Model A with 3" lens complete with stand — \$18.50
Model B with special 2" achromatic lens, complete with stand — \$27.50

GEORGE SCHERR CO., INC.

132 Lafayette Street

New York 13, N. Y.

In War, as in Peace...

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SAVE TIME and CUT COSTS!

CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

CERROSAFE (Melting Temp. 190° F.) Used to accurately proof-cast cavities such as molds, gun chambers, forging dies, etc. and for many similar applications.

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A Proven
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ECLIPSE SHIPPING LABELS TELL 1943 SUCCESS STORY

Hundreds of names . . . names that stand out on the "war production front" . . . have graced Eclipse shipping labels in 1943. Evidence that Eclipse is again "delivering the goods" . . . millions of Radial Drive Counterbores and Countersinks and other precision cutting tools, vital in speeding war production! A 1943 success story that will be bettered in 1944!



Manufacturers of RADIAL AND PIN DRIVE HIGH-SPEED AND TUNGSTEN-CARBIDE COUNTERBORES • COUNTERSINKS • BACK-SPOTFACERS • TWO-PIECE CORE DRILLS INSERTED BLADE CUTTERS • WELCH PLUG CUTTERS MULTI-DIAMETER CUTTERS AND SPECIAL DESIGN TOOLS.



ECLIPSE COUNTERBORE COMPANY
DETROIT 11, MICHIGAN

DECEMBER, 1943

YOU'VE HEARD ABOUT WET-BELT SURFACING

. . . Now Learn More About It



SEND FOR
THIS BOOK

Porter-Cable has prepared a booklet that is really a reference manual on Wet-Belt Surfacing, the new and better method that is speeding machining

operations formerly assigned to millers, grinders, planers, shapers, lathes.

WITH WET-BELT SURFACING YOU CAN:

- machine 5 to 25 times faster
- hold close limits, often .0005"
- work an entire area at once.
- produce final finish while taking cut.



★ WITH WET-BELT SURFACING YOU REDUCE:

- the need for cumbersome fixtures. Most jobs can be handled freehand, or with simple, inexpensive jigs.
- set-up and lock-up time. Very often both can be done away with entirely.

★ WITH WET-BELT SURFACING YOU ELIMINATE:

- heat, warping, distortion, discoloring, fracturing or chipping.
- dust or grit, injurious to health and shop equipment.

Because of the great demand for the new Porter-Cable booklet, at present it can be sent only to those who mention their company name and position when asking for it. Send for your copy right away.

PORTER-CABLE
MACHINE CO.

★ 1801-12 N. Salina St. Syracuse, New York

NEW EQUIPMENT

T. M. REG. U. S. PAT. OFF.

• Materials + Processing •



Rockford Slotting Machine With Hydraulic Ram Drive



Miller With Electric Control For Table And Spindle

HYDRAULIC SLOTTER

(M26)

Notable advantages of the 12" Hydraulic Slotter manufactured by the Rockford Machine Tool Co. are the hydraulic ram-drive and hydraulic feeds, according to a company announcement.

The ram is mounted in an independent housing and pivoted to tilt forward from the bottom to 10 degrees from vertical. Changing the ram stroke is effected without cranking, by means of dials at the side of the ram housing, which operate trip dogs. Simple means are provided for easily positioning the ram in relation to the work, and movement can be reversed instantly at any point in its travel in either direction.

The ram has powerful hydraulic drive from a cylinder mounted directly in its rear. Cutting speeds range from 10 feet a minute to 75 feet a minute, with any cutting speed desired available between these two extremes.

Other features of the machine are manual and hydraulic longitudinal and transverse feeds, micrometer dials graduated in thousandths of an inch for longitudinal and transverse feeds, manual and hydraulic rotary feeds to table, and power rapid traverse.

SELF-CONTAINED HYDRAULIC PRESS

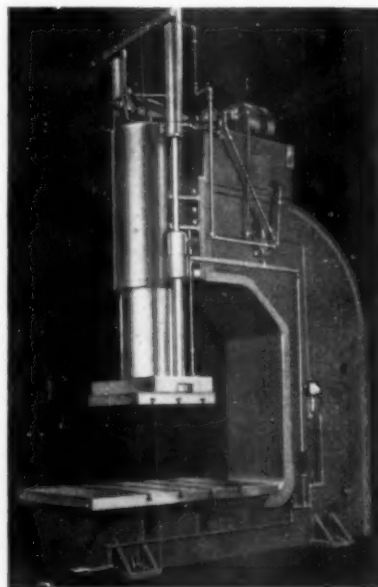
(M27)

Beatty Machine & Manufacturing Co. announces a new integrally built hydraulic press that is entirely self-contained.

The machine is intended for joggling plates and shapes; heavy forming and

bending in shipyards, car shops and tank shops; and for bridge and structural jobs. It is arranged for hand or foot control of the ram movement and is built in capacities from 5 tons to 350 tons.

Specifications include: stroke 36", advance speed 130" per min., pressing speed 12" per min., and return speed 175" per min.



Beatty Hydraulic Press

MILLING MACHINE

(M28)

Introduction of a plain milling machine, known as B-11, with complete electrical control for table and spindle power movements, has been announced by Abrasive Machine Tool Co.

The machine is said to have capacity for most work of medium size and to be ideally suited for all ordinary requirements for efficient production milling.

It has a built-in backlash eliminator on the table screw which is released automatically during fast travel, to permit climb milling in either direction up

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

to the capacity of the driving motors. Table movements can be changed quickly and accurately through electrical control. Other features include automatic reverse, fast table travel of 300" per minute, and an unusually wide selection of speeds and feeds.

HEAVY-DUTY CHISEL GRINDER

(M29)

Chief feature of the new heavy duty, double end, self-contained, chisel grinder recently introduced by The Standard Electrical Tool Co. is its arrangement for production grinding of a wide

(Continued on page 182)

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Additional information or bulletins relative to new equipment — new materials or new processes.

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When answering advertisements, specific information on problems or company representative's call.

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Simply fill out the card, indicating the information or service you desire, and mail.

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Requesting:

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TO CALL**

Wickman

PROFILE GRINDERS



The Carboloy Company, who received the first Wickman Profile Grinder built in this country two years ago, now operate four of these machines, three of which are shown above. Here is what Carboloy says about these machines:

"It is difficult to quote an over-all average of time saved because the tools differ so

widely but, generally speaking, the finish grinding on form tools suited to use of these machines can be done in about one-fourth the time that is required by other methods. The big advantage, in addition to the time saved, is that relatively unskilled help can do this work, and once a tool is ground to the projectograph template on this machine it is invariably correct."

MAKE POSSIBLE THE GRINDING OF FORM TOOLS By Relatively *Unskilled Men*

Present users of the Wickman Profile Grinder provide the evidence to prove that the machine effects definite savings in both machining time and in skilled manpower.

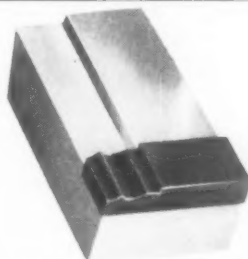
A man of limited skill can produce any desired contour with this profile grinder. An accuracy to within .0005" is easily obtained and reasonable care on the part of the operator makes closer limits possible.

The Wickman Profile Grinder incorporates a fifty to one pantograph for controlling the formation of the profile, and a 30-power microscope for observing development of the profile and for accurate inspection of the work before it is removed from the machine. Write today for full information.

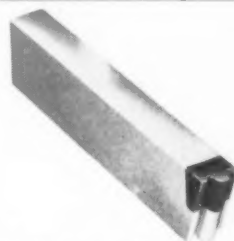
TYPICAL CARBOLOY
FORM TOOLS
GROUND ON
Wickman
PROFILE
GRINDERS



Circular form tool with preformed cemented carbide tips.
Stock removed015"
Grinding time including set-up Approx. 2 hrs.



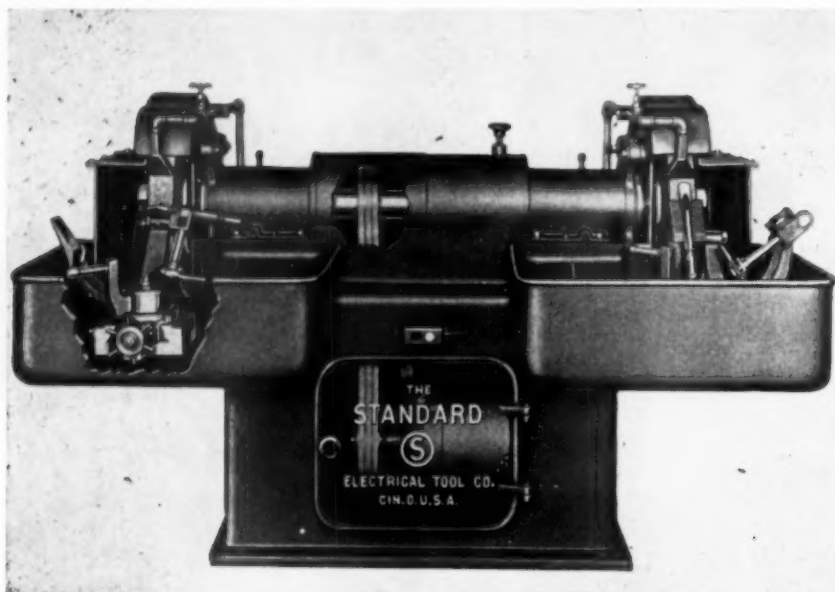
Flat form tool with preformed cemented carbide tip.
Stock removed015"
Width of tip 1 35/64"
Depth of cut 3/4"
Grinding time including set-up (lots of 50) Approx. 1 3/4 hrs.



Flat form tool with preformed cemented carbide tip.
Stock removed015"
Width of tip 51/64"
Depth of cut (Carbide only) 25/64"
Full depth of cut 55/64"
Grinding time including set-up Approx. 3 hrs.

THE **Wickman**
CORPORATION

15535 WOODROW WILSON AVE.
DETROIT, MICHIGAN



Heavy Duty Double End Chisel Grinder

variety of chisels.

According to the company, with one of these attachments it is possible to grind up to 1000 chisels per day per man. The attachment is intended not only for grinding new chisel blanks, but also for re-dressing used chisels.

Twenty-inch diameter high speed resinoid bond wheels with $2\frac{1}{2}$ " face are mounted on a spindle operating at

1700 RPM. The machine is equipped with flanges for 8" hole wheels.

Hoods and guards are constructed for convenient and quick renewing of grinding wheels. Each guard is furnished with all necessary fittings and adjustable nozzle with a valve for controlling the flow of water. Another feature of the grinder is the quick acting holder which per-

mits unskilled operators to accomplish a uniform finish on the chisel blanks.

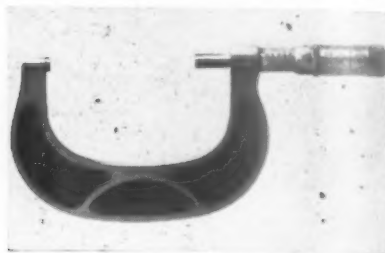
INFORMATION FREE

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1/10000" VERNIER MICROMETER

IM301

George Scherr Company has announced that all Reed micrometers in the 1", 2", and 3" sizes will be furnished with the vernier enabling quick and easy reading to 1/10000" at no extra cost. Because war-time manufacturing has called for precision measurements to tenths of thousandths of an inch, all



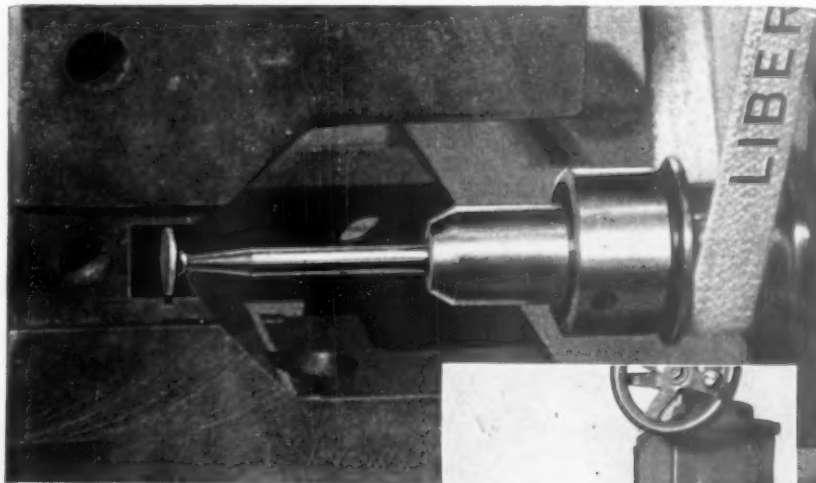
Reed Micrometer

purchasers of these micrometers will in the future receive a tool with "tenths" vernier at the same price heretofore prevailing for micrometers reading to one thousandths of an inch.

(Continued on page 184)

Liberty Attachments

Grinding a Difficult Keyway



This is Liberty Horizontal attachment No. 90-30 with collet chuck. It can be assembled to your surface grinder in 2 minutes without machining. It will do many intricate jobs which are otherwise impossible without this grinding attachment. The illustration shows the grinding of an inaccessible keyway. Liberty Attachments are available in Horizontal and Vertical models. They are adapted for use on many popular surface grinders. Can be had with solid quill or collet chuck. Hundreds of plants find them indispensable.

Send for Circular

LIBERTY TOOL & GAGE WORKS, INC.

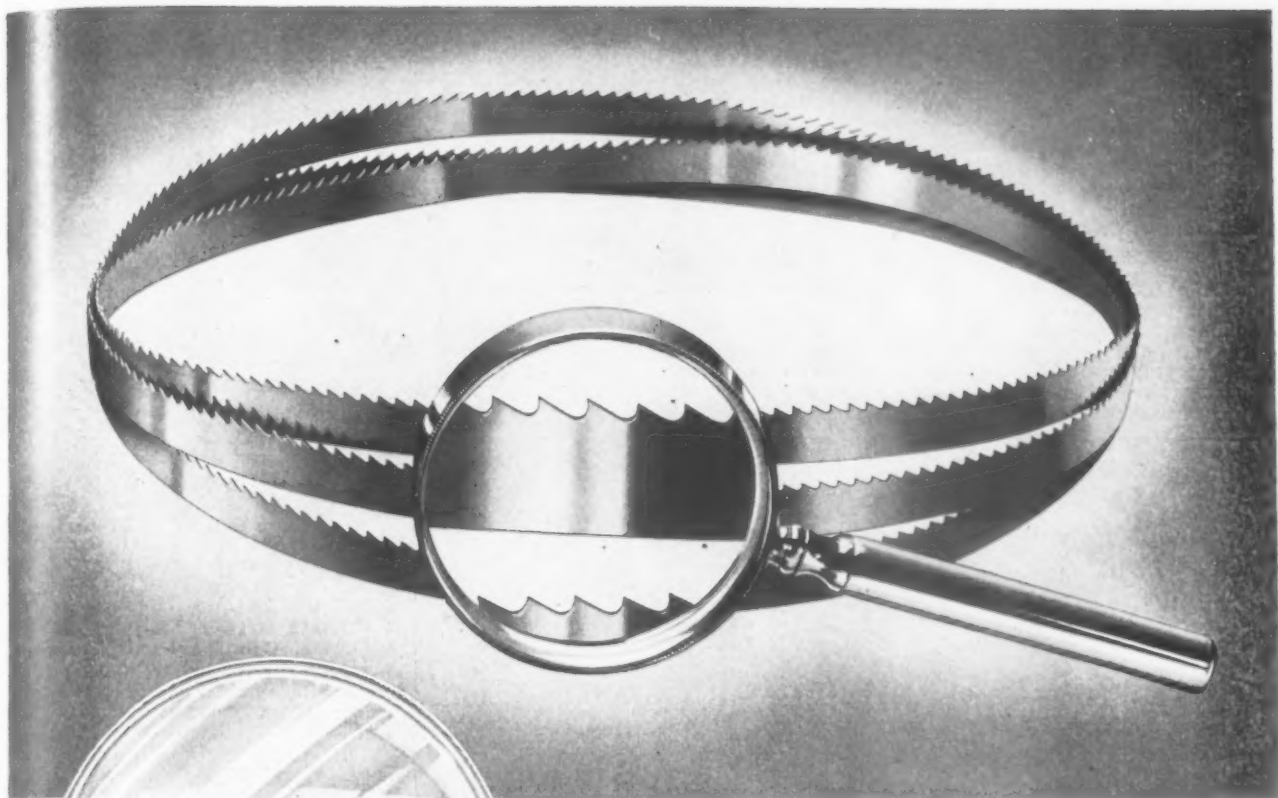
233 GEORGIA AVE.

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Tomorrow's Tools for Today's Tasks



THE TOOL ENGINEER



...mark of distinction

The BARNES diamond trade mark is your assurance of complete satisfaction. BARNES blades perform better because they are made better, by craftsmen with years of experience in blade manufacture exclusively. Order BARNES from your distributor.



The W. O. Barnes Company is glad to co-operate with the War Production Board in promoting tool conservation. Barnes factory trained service men are available in helping to solve blade problems.



IMPROVED TAP RECONDITIONER

(M31)

Featured by a new spindle head that accommodated interchangeably a wide range of motor types for the various service voltages, phases, and frequencies required in the industry, a new improved model of tap reconditioner has been announced by Detroit Tap and Tool Co.

High rigidity of the spindle head, plus the continuous adjustability for grinding-tool wear is obtained by mounting the spindle assembly on large dove-tail ways in the pedestal base, according to the company. Another feature of the machine is that the tap chamfering unit, located at the left

of the machine, is of the precision collet type and has been improved to facilitate changing of taps and collets and

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

to assure maximum locating accuracy. It will accommodate collets from the smallest machine screw size up to 1-1/4" standard tap shank size, including long shank taper taps.



Improved Tap Grinder

LIGHT-WEIGHT PORTABLE POLISHER

(M32)

Developed to take the place of larger, heavier units for buffing and polishing work, a new light weight, portable polishing machine has been introduced by Lewis Roe Manufacturing Co.

The unit weighs about 100 lbs. and is easily moved about the shop to vari-



Portable Polisher

ous jobs. It is equipped with self-aligning ball bearing pillow blocks carrying a spindle 3/4" in diameter and 22" long. The spindle is tapped for taper points which are furnished with the machine.

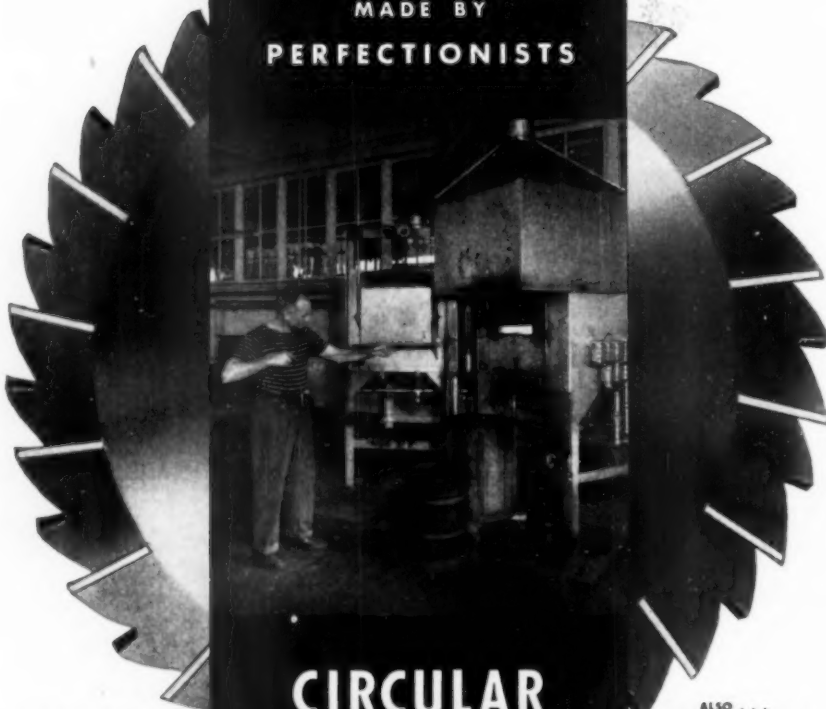
AIR TURBINE MOTOR

(M33)

Onsrud Machine Works, Inc., has made available a full line of air turbine motors to manufacturers able to incorporate this type of motor in their products.

Operating on an impulse reaction principle, the solid milled rotor with bucket-type impeller blades employs an air-feed back system to achieve high (Continued on page 186)

CIRCLE R METAL CUTTING SAWS MADE BY PERFECTIONISTS



CIRCULAR TOOL COMPANY, Inc.

PROVIDENCE, R. I.

CHICAGO • PHILADELPHIA • NEW YORK

DAYTON • CLEVELAND • SYRACUSE

INDIANAPOLIS • DETROIT • ST. LOUIS

Heat treating in furnaces automatically controlled by potentiometers, the most accurate instruments made for the purpose. Thus uniform toughness and a durable cutting edge are assured.

ALSO . . .
COMBINATION DRILLS
AND COUNTERSINKS
AND REAMERS





Tolerance

$\pm .0001''$

with the

**MOORE
JIG BORER**

The deadly accuracy of our most powerful weapons starts with accuracy in the machining of their smallest parts. Ten Moore Jig Borers operated by women at the Arma Corporation speed the production of high-precision instruments for the United States Navy.



7

or the complex equipment of war—and the amazing age of mass production to follow—tolerances thought impossible to attain a few years ago are today routine requirements. The Moore Precision Jig Borer answers the increasing demands for greater accuracy and speed in boring holes for jigs, fixtures, dies, gauges and special machine parts—and yet is so simple to operate that women quickly become proficient at it. ☞ Moore-produced micrometer screws, ground to an accuracy never achieved before, give the Coordinate Location Method—an outstanding feature of the Moore Jig Borer—definite advantages over the graduated scale and size block methods of measurement. Inaccuracies between any two points, with the long screw, will not exceed .0002" and with the short screw .0001". The Moore Jig Borer is guaranteed to space and bore holes accurately within limits of .00025" in any position of the table. ☞ The range, sensitivity and rigidity of the spindle are evidenced in its ability to drill holes of 1/32" or less and yet to take a one-quarter inch cut accurately in increasing a hole from 2" to 2 1/2" in one cut under power feed.



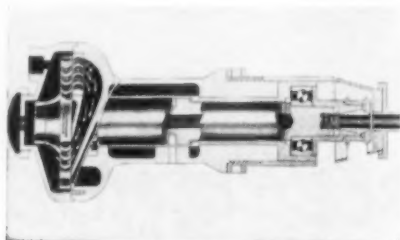
PARTNERS IN PRODUCTION—The Moore Jig Borer and the Moore Jig Grinder, each outstanding in its own specialty, together form a modern toolroom partnership to save production time and increase die life. The Jig Grinder finish-grinds holes to size and location on both hard and soft work within .0001". Write today for descriptive literature on how these two machines will modernize your toolroom production.



MOORE SPECIAL

TOOL COMPANY INC.

740 UNION AVENUE, BRIDGEPORT 7, CONN.



Onsrud Air Turbine

efficiency, according to the company. The expanding air, together with "Metered Mist" developed by Onsrud engi-

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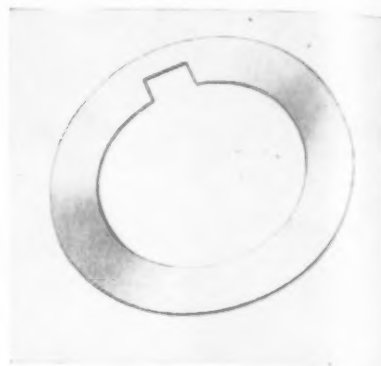
neers, holds unavoidable wear to a minimum, the company adds.

The motors are available in sizes ranging from 1/6 hp. to 3 hp., operating at speeds from 15,000 rpm to 100,000 rpm.

ARBOR SPACER

(M34)

Spacing of milling machine cutters



New Thin Arbor Spacer

down to as fine as .0005" is possible with use of a new size metal arbor spacer (.0015") according to the manufacturer, Detroit Stamping Company. This new .0015" spacer is available in all standard arbor sizes.

INDUSTRIAL FLUID REFRIGERATION SYSTEM

(M35)

Especially suitable for cooling and temperature maintenance of coolants for metal cutting, hydraulic oil applications, maintenance of submerged bearing temperatures, quenching oils, spot welders, and laboratory set-ups, a new



Gray-Mills Coolant Conditioner

industrial fluid refrigeration system has been developed by Gray-Mills Co.

Known as the Model 400, the unit mechanically refrigerates fluids, settles and screens out chips and coarser abrasives, and applies the coolant or fluid to the work through the medium of a self-contained pump. According to the company, actual operating results on screw machine work shows that many standard speeds and feeds can be increased as much as 50% with a corresponding reduction of 50% in "downtime" for tool resharpener.

No water connections are required for operation of the machine which refrigerates mechanically, making it completely portable and ready to go to work simply by plugging it into the power line. The capacity of the cooling tanks is 35 gallons.

NEW MACHINE TOOL HONE

(M36)

The Tungsten Alloy Manufacturing (Continued on page 188)

THE TOOL ENGINEER

WHY NOT LET GOOD ENGINEERING SOLVE YOUR MANPOWER PROBLEM?



One of America's largest technical engineering organizations.

MANAGEMENT ENGINEERING

- ★ Tool Designing ★ Plant Layout and Routing
- ★ Process Engineering ★ Product Engineering
- ★ Designing of Jigs, Tools, Fixtures, Gauges, Dies and Special Machines.

LaSalle Designing Company

AL J. CONN, Managing Director

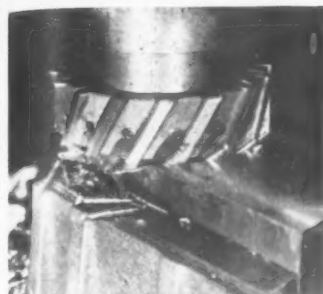
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INGERSOLL SHEAR CLEAR



SHEAR CLEAR FACE MILL



CONVENTIONAL FACE MILL

SMOOTHER FINISH
FASTER FEEDS
LONGER TOOL LIFE
LESS POWER REQUIREMENT

● If you are milling flat surfaces it will pay you to investigate the benefits of applying Ingersoll Shear Clear Cutters to your work. Your inquiry should state diameter and hand of cutter, type of material and amount of stock being cut.

● The Ingersoll Shear Clear face mill is a patented design based on the discovery of entirely new cutting angles. The blades are set in the cutter body at steep negative rake and positive shear angles . . . The blade strikes the work-piece at a point ahead of center on its beveled cutting edge and gradually increases the chip width in a shearing action. (See upper sketch). It has been proven that a blade thus eased into the work causes far less impact shock and suffers less itself than the conventional blade, whose cutting edge strikes the work-piece squarely (See lower sketch) . . . Here the blades are set at relatively slight rake and shear angles.

● The Shear Clear chip coils evenly and continuously outward and falls away from the cutter at the end of the cutting arc . . . This is demonstrated in the upper row of photographs . . . Chips of the conventional cutters break up and fall under the face of the cutter, there to be ground over the milled surface. (See lower photographs).



THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILL.

Co. announces introduction of a new machine tool hone consisting of diamonds held securely in a matrix of tungsten carbide.

Such construction, according to the company, resists wear, prevents displacement of diamonds when they contact a hard surface or edge, and lengthen hone life. Three grades of hone are available: rough—100 grit; medium—150 grit; and fine—200 grit.

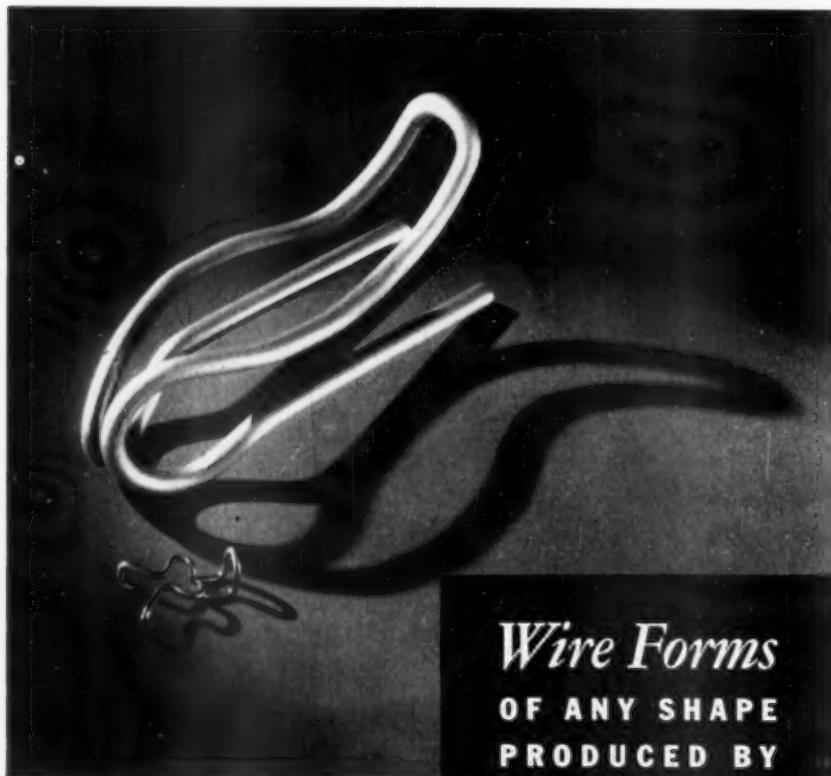
Also announced by this company is the new cast tungsten-chromium-cobalt alloy developed to fill the gap between high speed steel and tungsten carbide.

According to the maker the tungsten stands up better than high speed steel,

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and has higher shock resistance than tungsten carbide. Known as "Speed-alloy", it can be run faster than high speed steel with about the same depth of cut and will machine all materials with the exception of manganese steel and chilled iron. It is said to be proving exceptionally suitable for chromium and nickel alloys, including stain-



Wire Forms OF ANY SHAPE PRODUCED BY MUEHLHAUSEN

AT first glance, the intricate designs of many wire forms look like the "doodlings" on an engineer's scratch pad; yet each twist and turn serves a necessary function—either that of cushioning, retaining, or joining. One Muehlhausen wire form may be used to cushion the reflector of a searchlight; another may firmly grip the ceramic insulator in a power line circuit breaker.

Muehlhausen is currently producing a variety of wire forms for use in war products, the unusual requirements of which are being met by this company's experienced designers, skillful tool makers, and extensive fabrication equipment. MUEHLHAUSEN SPRING CORPORATION
Division of Standard Steel Spring Company
625 Michigan Ave., Logansport, Indiana

MUEHLHAUSEN SPRINGS



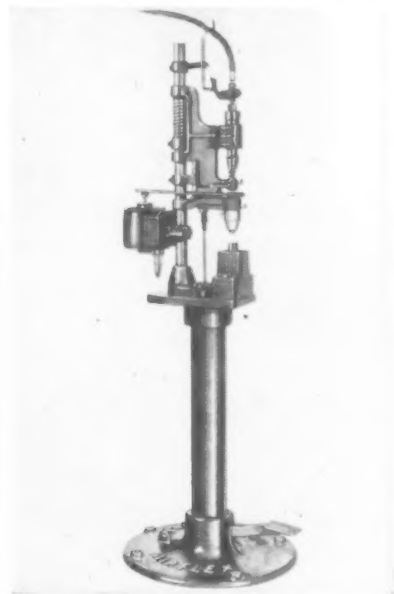
EVERY TYPE AND SIZE

less steel. It is available in solid tool bits, flats and an extensive variety of tipped tools.

RIVETING MACHINE

(M37)

Airflex Equipment Co. announces that its latest model of riveters include an advance pressure pad consisting of an aluminum housing, spring and pilot,



Airflex Riveter

with the pilot fore-running the peening tool to hold the assembly rigidly against the rivet set.

This feature, the company states, eliminates fatiguing vibration and makes accurate work possible. The Airflex Spinner Riveter made by the company makes round, oval, flat head rivets; peens, shafts, pins, and studs; and furls or swages shoulder bushings and light tubes to sheet metal or plastics. In operation the riveter delivers short ($\frac{1}{4}$ " max.) strokes in rapid succession from an air operated peening tool. Frame travel is approximately 2" and throat depth is 5".

CEMENTED CARBIDE ROTARY FILES

(M38)

Six new tools have been added by Carbur, Inc., to its standard lines of cemented-carbide rotary files. These
(Continued on page 190)



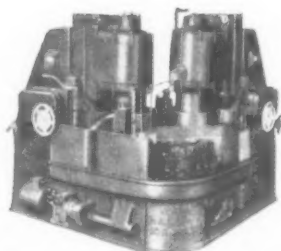
Carbur Rotary Files

THE TOOL ENGINEER

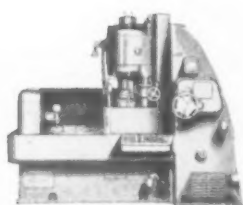


IF IT'S A FLAT SURFACE THERE'S A HANCHETT TO GRIND IT

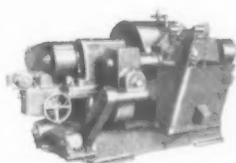
TO COVER *all* OF YOUR SURFACE GRINDING JOBS



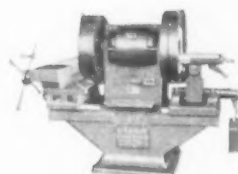
VERTICAL MULTI-SPINDLE
ROTARY TYPE
SURFACE GRINDER



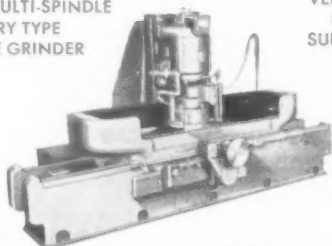
VERTICAL SPINDLE
ROTARY TYPE
SURFACE GRINDER



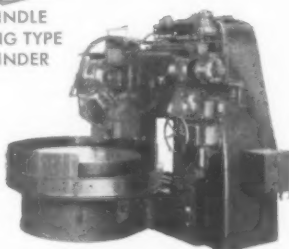
DOUBLE SPINDLE
DISC GRINDER



SINGLE SPINDLE
DISC GRINDER



VERTICAL SPINDLE
RECIPROCATING TYPE
SURFACE GRINDER



ROTARY
PLANO GRINDER



TRAVELING WHEEL
FACE GRINDER

When selecting a surface grinder your first consideration is for a machine which will most efficiently solve your grinding problems. Hanchett engineers can give you an unbiased opinion. The wide range of Hanchett types makes possible this unique service wherein the grinding principle is the prime factor. Made by specialists in Flat Surface Grinding, the complete Hanchett line includes all of the types shown here, and many others. If you are experiencing difficulties with surface grinding jobs on which precision and high production are of paramount importance, let our engineers recommend the type of surface grinder which will provide the best solution. Write today outlining your requirements.



Ask for Catalog
No. 170T-2



IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.
BIG RAPIDS, MICHIGAN U.S.A.

now are available in three shapes, each of which is furnished in two sizes.

The company asserts that these new rotary files offer at least 50 times the life of similar style high speed steel tools. All of these tools have cutting teeth ground from the solid. Other advantages claimed for these cemented-carbide files are maintenance of a sharp cutting edge over a long period of time, reduction of burring time per part, general efficiency in burring operations in all kinds of production, less replacements, and considerably reduced inventory of rotary files.

Also pointed out by the company is the fact that tool sharpening is reduced in proportion to the life of the tool, and

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that these carbide tools can be run at much higher speed than is possible with steel rotary files.

AUTOMATIC SORTING MACHINE

(M39)

Tubin Engineering & Manufacturing Co. has developed a new machine which automatically sorts to length dural,

brass, and steel machine screws, bolts, and rivets.

The machine delivers from 85,000 to 100,000 sorted parts in 8 hours, sorting to $\frac{1}{8}$ ", $\frac{1}{16}$ " or $\frac{1}{32}$ " variation in lengths. It is possible to sort 24 different lengths at one time into separate



Sorting Machine

receptacles, with a throw-off receptacle for lengths not set for sorting on the machine.

The machine is designed for aircraft, automobile and shipbuilding plants, and for any industry using a multitude of small hardware parts, where recovery of wasted parts from floor sweepings and stockroom mixups is a critical problem. It also can be used with type sorting by belts and diameter sorting through rollers. The company states that five machines can be handled by one inexperienced girl operator.

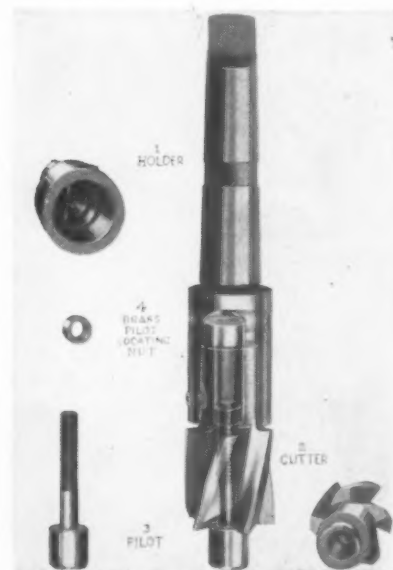
SHEARPROOF COUNTERBORE

(M40)

Moreland Tool Co. announces a new shearproof counterbore drive that utilizes the eccentric principle, completely equalizes the torque load on the holder and the mating driver member of the cutter.

The driving member of the cutter fits into a spherical off-center hole in the holder. Without any sharp edges, pins or wedges, this method of coupling cutter and holder eliminates any tendency to shearing action.

(Continued on page 192)

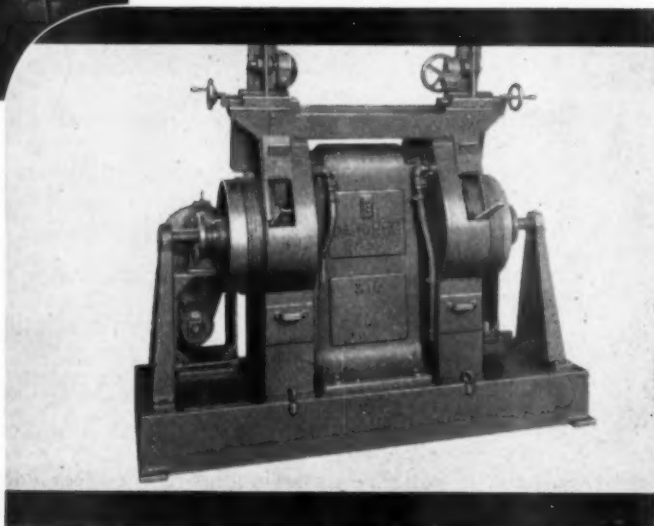


Moreland Counterbore Drive

THE TOOL ENGINEER



Bullet cores are ground at 60 to 90 per minute on this special
GARDNER GRINDER



ANOTHER of the many war jobs on which GARDNER-GRINDING is speeding production, is the bullet cores seen here. A battery of 8 special Gardner No. 218-18" Grinders are turning them out in great quantities in the plant of one of our customers.

The job is to grind a flat on one end of the bullet core, holding to a dimension for length.

TWO rotary work-carriers, one on each end of the machine base, are used. The cores are fed from a chute into notches around the periphery of the work-carrier, the operation being practically automatic.

PRODUCTION: 60 to 90 pieces PER MINUTE, per operator (2 girls employed on each machine). Tolerances: $\pm .0015$ " for length, and squareness.

Let GARDNER solve YOUR production problems—WRITE FOR OUR "MODERN METHODS" BOOKLET!

GARDNER-GRIND
YOUR Flat SURFACES

GARDNER MACHINE COMPANY

442 East Gardner Street • • • Beloit, Wisconsin, U.S.A.

Another use for MASONITE* DIE STOCK

As America's amazing aircraft production soars to new highs, manufacturers find more and more uses for Masonite Die Stock.

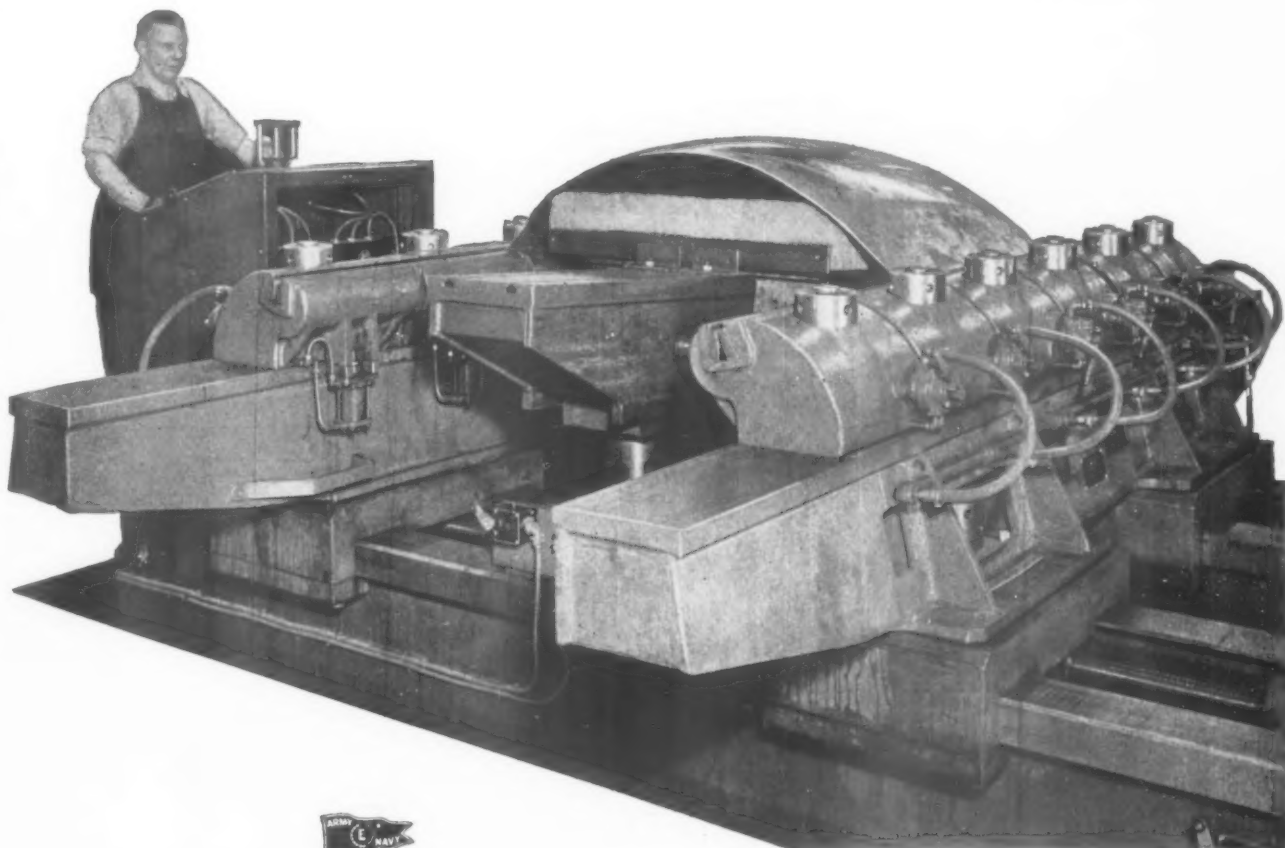
Already widely employed by aircraft manufacturers to help shear and form airplane parts, this remarkably durable, light-weight, semi-plastic material is now being used for forms on stretching machines . . . permits easy handling of

large forms . . . will not shrink, check or twist.

Manufacturers in many other fields, too, are saving time and money by using Masonite Die Stock for special types of mating dies, forming blocks, templates, jigs and fixtures.

Masonite Die Stock can be fabricated in pattern or metal shops with great speed . . . is available in thicknesses of $\frac{1}{4}$ to 2 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For further details, please mail coupon below.

↓ This photograph shows how Masonite Die Stock is used to stretch and form sheet metal for airplane parts at the Grumman Aircraft Corporation.



*TRADE-MARK REG. U. S. PAT. OFF. "MASONITE" IDENTIFIES ALL PRODUCTS MARKETING BY MASONITE CORPORATION. COPYRIGHT 1943, MASONITE CORP.

MASONITE CORPORATION Dept. TE-12, 111 W. Washington St., Chicago, Ill.

Please send me illustrative literature and complete information about Masonite Die Stock.

Name and firm _____

Address _____

City _____ State _____



**FOOT-OPERATED
AIR VALVE**

(M41)

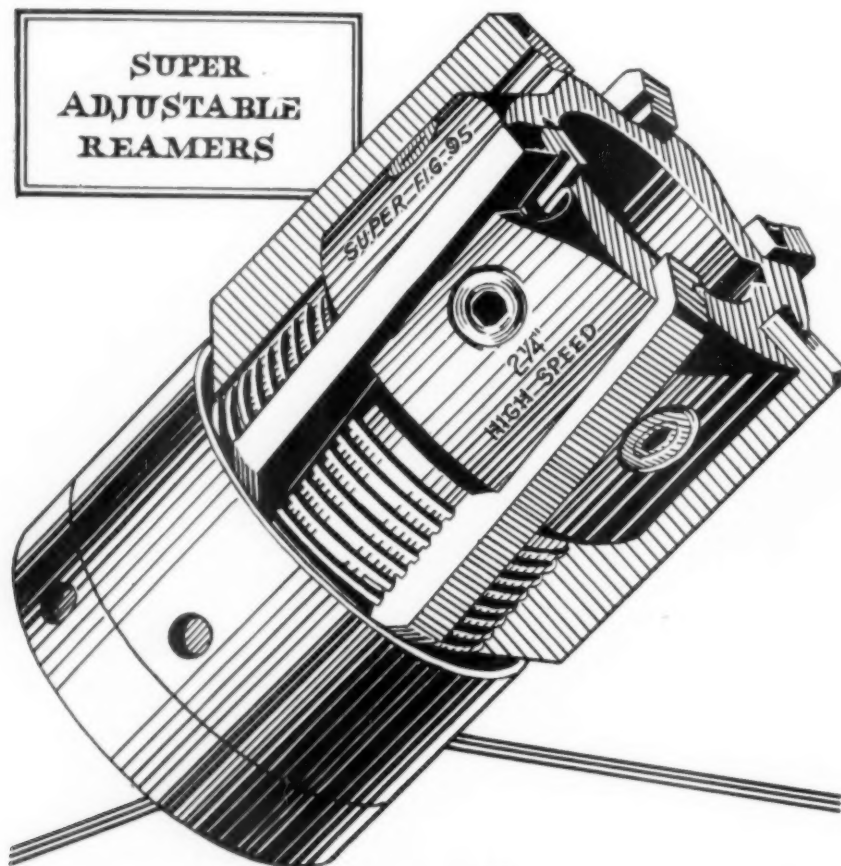
Designed for general use on all types of pneumatic equipment, such as air holding devices on lathes, air vises, and operating cylinders, a new foot operated valve has been placed on the market by Anker-Holth Manufacturing Co.

Available in sizes from $\frac{1}{4}$ " to $\frac{1}{2}$ ", the valve is of the disk type which assures economy of maintenance and long, trouble-free life, according to the company. When the valve pedal is pushed down and the foot removed, the pedal returns to neutral but the work is held until the pedal is again pushed down.



Anker-Holth Air Valve

**SUPER
ADJUSTABLE
REAMERS**



IN forty years' experience in the manufacture of adjustable, inserted-blade reamers, McCrosky has furnished many answers to the question of how to ream holes more accurately and more economically. All the answers are in the practical and proved design of today's SUPER Adjustable Reamers.

For Reamer Bulletin and Manual write to McCrosky, Meadville, Pa.

McCrosky TOOL CORPORATION
MEADVILLE, PA.

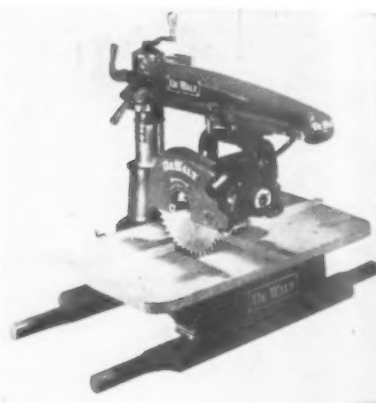
**COST
CUTTING
TOOLS**

**PORTABLE
POWER SAW**

(M42)

Built especially for cutting right on the job, thus saving materials handling and time, and relieving manpower for other jobs, a new portable radial power saw has been developed by DeWalt Products Corp.

The cutter will cross-cut material 14" wide 1", 12" x 3" with 12" saw, and rip from 0" to 26" wide. It also will miter, rip, bevel, cut off, double miter and bevel rip. Together with such tools as dado heads, shaper cutters, router



DeWalt Rotary Saw

bits, and others, the unit is actually a woodworking shop in itself, says the company.

The machine also can be used to cut light metals, ferrous and non-ferrous, when equipped with a metal saw.

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**NEW SMALL
COOLANT PUMP**

(M43)

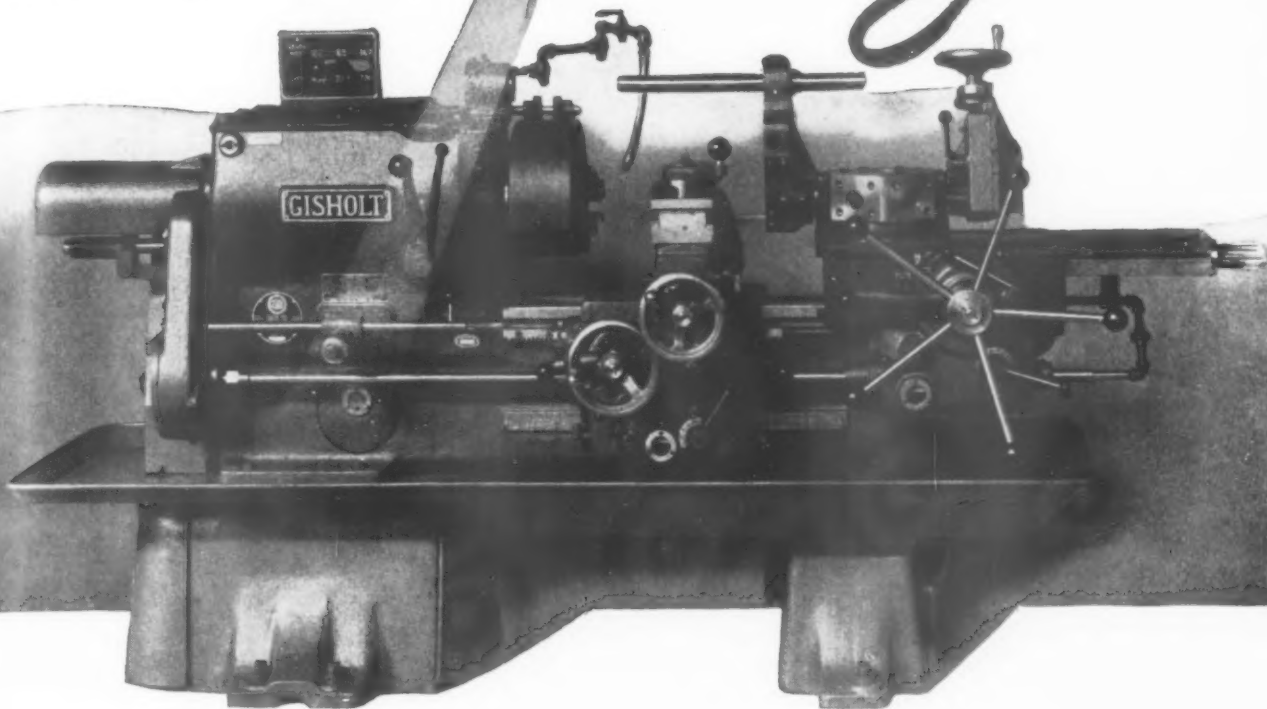
Designed to meet the needs of operators of small machines such as hand mills, surface grinders, internal grinders. (Continued on page 194)



Pioneer Coolant Pump

THE TOOL ENGINEER

Announcing



SMOOTHER, SWIFTER, EFFORTLESS OPERATION with hydraulic clutching and braking

Now, as an aid to war production, Gisholt announces hydraulic control for starting, stopping and reversing the spindle. It takes only a flick of the control lever—right or left—to engage the forward or reverse clutches. In neutral, or stop position, automatic hydraulic braking of the spindle brings work quickly and smoothly to rest.

This finger-tip control saves time, of course. It speeds up production, especially where rapid work calls for frequent starting and stopping of the machine. It saves effort; for muscle power is supplanted by hydraulic power. It enables

women to "man" the turret lathes without physical exertion. And clutches may be adjusted to pull the heaviest cuts that the tools and work will stand.

For over two years this hydraulic control has been proved and perfected under actual shop conditions. It is now supplied as standard equipment on all Gisholt Ram Type Turret Lathes.

GISHOLT MACHINE COMPANY
1219 East Washington Avenue • Madison, Wisconsin

LOOK AHEAD • KEEP AHEAD • WITH



IMPROVEMENTS IN METAL TURNING

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

ers, drill presses, tapping machines, and the like, a new small size seal-less pump has been developed by the Pio-

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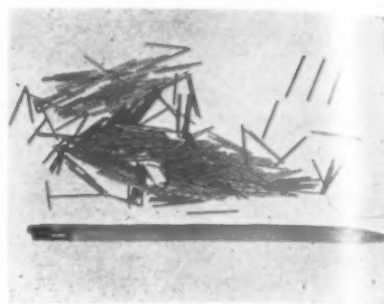
neer Pump and Manufacturing Co. Slightly under 16" in height, the pump is a submerged type and is intended for machines having a coolant sump in their base or for machines pro-

vided with separate coolant tanks. Brackets and flanges are available for mounting the pump on the edge, side or top of separate supply tanks. Chips or dirt that will pass through the grille located in the bottom of the pump will readily pass through the pump itself without injuring the mechanism, according to the company.

ALLOY FOR SMALL PARTS

(M44)

Haynes Stellite Co. has placed on the market an alloy of tungsten, chromium and cobalt in a form suitable for instrument bearing pivots, phonograph and recording needles, needle valves, and similar small parts applications.



Small Parts Alloy

According to the company this stainless metal is resistant to many corrosive actions and to all normal atmospheric conditions. As it is not possible to machine it in small parts, these are cast close to size and approximate shape and are finished by grinding and lapping if necessary.

The company points out that this alloy is not recommended as a substitute for sapphire bearings, but is best used as a pivot tip operating in a jewel bearing. However, it can be used successfully in brass or steel pivot holes.

PRECISION AIR GAGE

(45)

Numerous unusual applications are possible with the new "Precisionaire" measuring instrument developed by Sheffield Corporation, according to a company announcement. One interesting example is use of the instrument to check four dimensions in a 658" depth of a tapered hole in the hub of an airplane propeller, to a manufacturing tolerance of .00033".

Two instruments are required, each equipped with two tubes providing approximately 10,000 to 1 magnification.



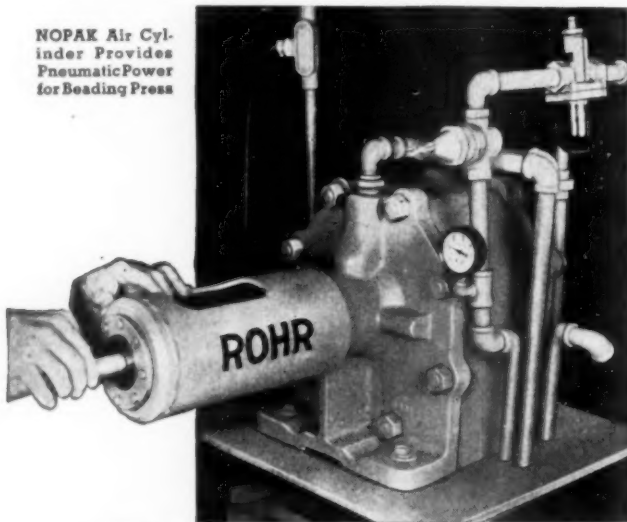
Sheffield Measuring Instrument

The gaging spindle is connected to the instruments by four lengths of rubber hose, one for each glass tube. The air from each tube flows through the proper set of two diametrically opposed orifices, by an arrangement of four brass sleeves.

A set of master chamber gages, a maximum and a minimum, is required for setting up the twin instruments. The spindle is first placed in the maximum master gage, and the top markers for all four tubes are set at the exact point to which the float rises. The same method is used with the minimum master gage, and the low markers are set similarly. When the float rises to any point between the two markers, the work is within tolerance limits.

(Continued on page 196)

NOPAK Air Cylinder Provides Pneumatic Power for Beading Press



Beading Time Cut 95% in Rohr Tubing Department

A novel tube-beading press has been developed at the Rohr Aircraft Plant, which puts a bead on chrome or monel tubing in 2 to 3 seconds; 20 times faster than previous methods!

The heart of this press is its unique die-assembly which works like the collet in a screw machine. An expandable rubber inner die, inserted in the tube end, is pulled into a 4-section metal outer die. The expansion forces the metal into the beading cavity of the outer die. Dies for various tube sizes can be changed in 10 seconds or less.

Dependable pulling power for this fast-working press is furnished by a Standard NOPAK Model "A" 12" Air Cylinder, controlled by a foot valve. Turning out "beads" at the rate of 20 to 30 per minute establishes NOPAK Cylinders as a dependable source of pneumatic power for continuous high-speed production operations. Ask for Cylinder Bulletin 82-A.

GALLAND-HENNING MFG. CO.
2757 SOUTH 31st STREET • MILWAUKEE 7, WISCONSIN

Representatives in Principal Cities

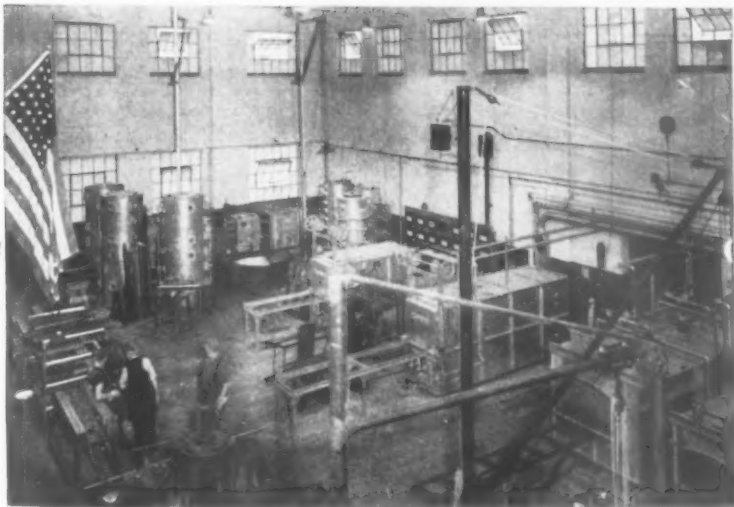


NOPAK Cylinders are at their best when controlled by NOPAK 2-, 3- and 4-Way Valves—Hand, Foot or Solenoid Operated.

NOPAK

VALVES and CYLINDERS

DESIGNED for AIR or HYDRAULIC SERVICE



A corner of the Colonial Heat Treat Department.

*How to get more out of
your Broaches-----*

BY PROPER HEAT-TREAT

The difference between an ordinary broach and a really good one is frequently traceable to the heat-treatment before grinding. Of course, you can't take all your broaches and heat-treat them yourself for longer life. But you can make sure that they are properly heat-treated.

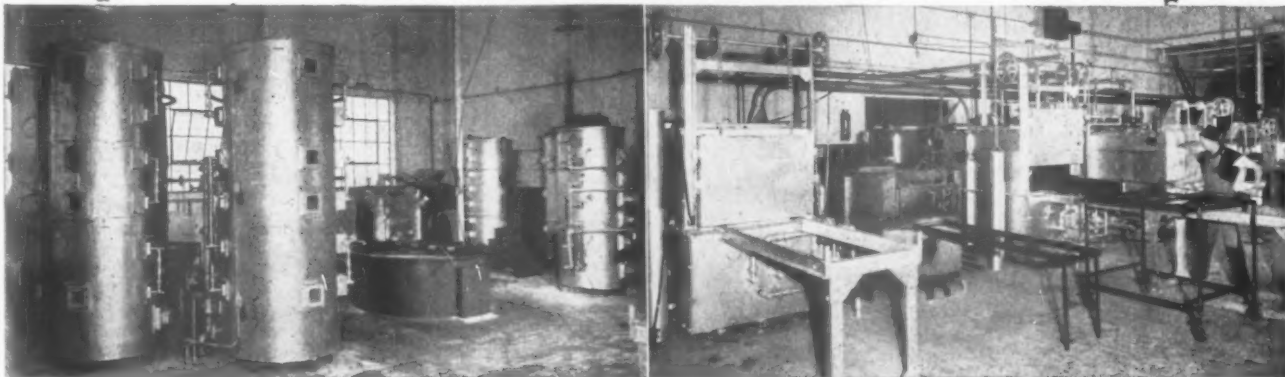
One of the best ways to do this is to check into your broach supplier's heat treating equipment.

As a starter, we will be glad to tell you about our new, modern and complete Heat Treat Department. It will give you an idea why Colonial Broaches do such an outstanding job.

Ask for a copy of Broaching News—Vol. V, No. 2.

colonial **BROACH COMPANY**
 25th Anniversary **DETROIT 13, U.S.A.**
Broaches  *Broaching Machines - Broaching Equipment*

Some of the vertical and horizontal Heat Treat Furnaces at Colonial.



SOLDERLESS CONNECTORS

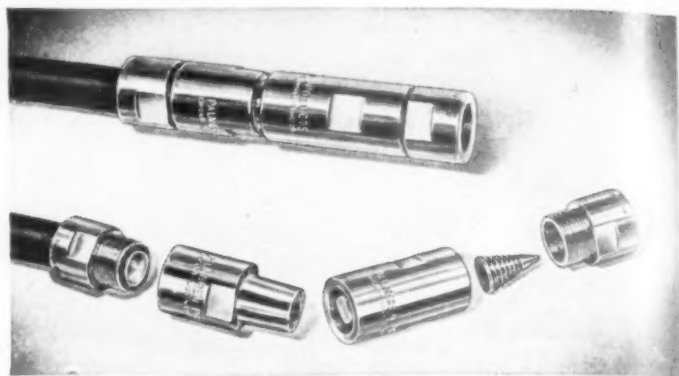
(M46)

Quick, easy assembly of various lengths of welding or other cables to their respective connectors in the field and on the job is the chief feature of the new Palmgren Rapid Cable Connectors, according to the manufacturers, Chicago Tool & Engineering Co.

Special tools to make connections are not necessary, according to the company as the only tools required are a knife to remove the wire insulation, and a pair of pliers to tighten the nut.

The body of the connector may be adapted to welding cable in sizes ranging from No. 1 to No. 3/0 inclusive

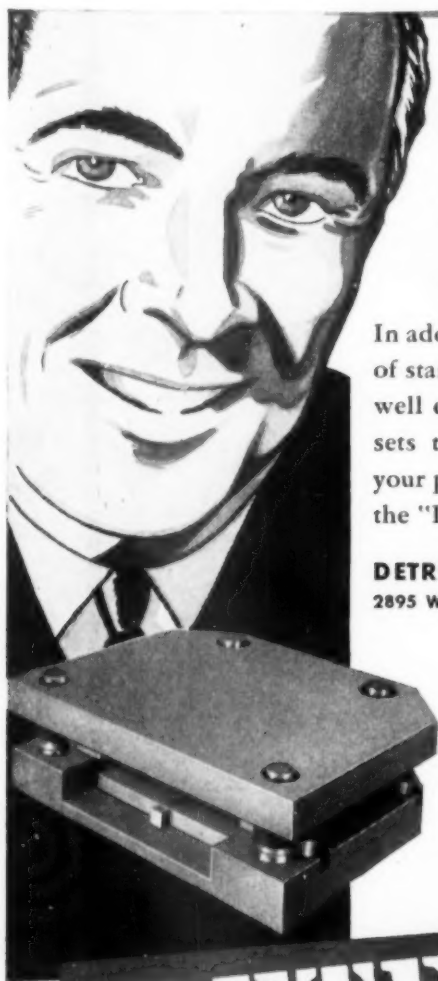
**Palmgren
Solderless
Cable Con-
nectors**



merely by using the proper size adaptor nut. The new solderless cable connectors are interchangeable with the standard solder type cable connectors made by the company. A cable having a standard Palmgren Solder Connector at one end can be plugged into another cable having the solderless type connector.

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NEED
Special Service
ON
SPECIAL DIE SETS?
Call "DETROIT"

In addition to making a complete line of standard die sets, we are especially well equipped to produce special die sets to your specifications. Send us your prints for prompt action—or call the "Detroit" man in your area.

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2895 W. GRAND BLVD. DETROIT 2, MICH.

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MINNEAPOLIS	AT 5264
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TOLEDO	GA 5706
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PORTLAND, Ore.	BR 0561
SAN FRANCISCO	MA 8532
NEW YORK	CA 6-1760
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DETROITT
DIE SETS ★

DIAL INDICATOR CHECKING DEVICE

(M47)

Clark Instrument, Inc., has announced a new device for checking the accuracy of dial indicators. Called the "Clarkator", it employs the sine bar principle, checking against the tangent of the angle.

The indicator to be tested is mounted on the top of the device with its spindle resting on a lapped angle block, which is advanced or retracted by a screw. After the indicator has been clamped into position with the zero reading coinciding with the dial face on the Clarkator, the screw is revolved in either direction to check other indicator readings.

The device is said to be useful for (Continued on page 198)



Clark Indicator Checker

THE TOOL ENGINEER

LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRI

DECEMBER, 1943

In the rush to retool plants and put war jobs into production, cutting fluid requirements could not always be given due consideration. That's one reason you'll find that a recheck of the coolants used on your machining, grinding, and stamping operations now may be the most productive check you make on tool waste.

Make a cutting fluid analysis the first step in your tool conservation program. Let a Standard Cutting Oil Specialist help you. Just call the nearest Standard Oil Company (Indiana) office, or write 910 S. Michigan Ave., Chicago 5, Illinois. In Nebraska, contact any Standard Oil Company of Nebraska office.

A diagram of a hand-operated sprayer. It features a central pump handle and a nozzle assembly. Two labels with arrows point to different parts: 'SOLUBLE OIL' points to the nozzle, and 'CUTTING OIL OR WHITE LEAD' points to a side port on the pump handle.

Stanicool H.D.—a heavy duty, emulsifiable oil—will do many of the in-between jobs on which a cutting oil won't give adequate cooling, and a conventional soluble oil won't give the required finish or tool life.

Oil is Ammunition . . . Use it Wisely

**STANDARD
SERVICE**

★ LUBRICATION ENGINEERING

receiving and periodic inspection of both standard direct reading indicators and reversed reading indicators used on Rockwell hardness testers.

TOOL GRINDER

Hammond Machinery Builders announce a newly designed line of 10" and 14" carbide tool grinders. A new coolant feature enhances the facilities for properly flooding the tool while grinding wet.

Coolant spouts are fully adjustable with the wide outlets which permit the correct flushing of the work by a slow cascade of coolant without force. Operator and floor are kept completely dry

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

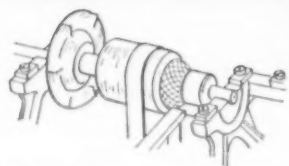
by new large splash pans around the table which provide adequate protection to the operator and do not obstruct vision of the work.

Another feature of the machine is the safety cup disc which prevents the possibility of an operator accidentally knocking tools into the well of the cup wheel. The disc moves in with the hood and table as the wheel wears. Also, an

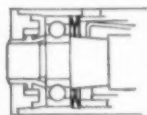


Hammond Carbide Tool Grinder

THE WHY OF DUMORE PRECISION



Balanced Parts: All rotating parts are dynamically balanced to prevent vibration and insure precision.



Preload Spring: Patented feature assures smooth running bearings at high speeds.

Matched Parts: All fitted parts are finished to the closest possible tolerances, and matched to assure a practically perfect fit. This contributes materially to initial and continued precision.

"Fog-of-Oil" Lubrication: Tapered ends of main spindle act as oil slingers, delivering constant supply of atomized oil directly into ball bearings.

THREE HAND MODELS FOR MANY USES



DUMORE GRINDERS ARE SOLD BY AUTHORIZED DISTRIBUTORS IN ALL PRINCIPAL CITIES

The Quill is the Heart of the Grinder

Scientific Design backed up by Precision Manufacturing

Every detail of Dumore design has a sound, scientific basis. Every operation in building Dumore Grinders is carried out in the most exacting manner. The result is a tool that delivers highest initial accuracy and maintains its precision through long years of service.

With a Dumore, you can convert almost any type machine tool into a precision grinding machine. Catalog 42 contains many interesting examples. Send for a copy today . . . The Dumore Company, Grinder Division, Racine, Wisconsin.

Dumore
PRECISION and Off-Hand GRINDERS

improved concealed, swivel no-splash guard on the wheel closes one side of the cup wheel while the other is in use. This is said to aid greatly in giving maximum visibility to the operator and providing complete freedom of motion of the tool around the working area of the wheel.

BACKSTAND IDLING ATTACHMENT

A new backstand idler used to adapt grinding and polishing lathes to endless belt grinding has been announced by Porter-Cable Machine Co.

The new model, known as ABS Backstand Idler, makes possible the use of an endless cutting abrasive belt for faster cutting and more easily obtained finishes. Another feature cited by the company is that heat is greatly reduced because of the long belt used thus greatly decreasing such hazards as heat, discoloration, warping, and fracturing.

Lower grinding and polishing costs also are possible through use of the backstand idler, the company points out, because the rough polishing operation can be eliminated. The unit is recommended for grinding welds, flash, generating radii, flat and edge work, cleaning up, polishing, and similar operations. Any width belt up to 6" can be used.

(Concluded on page 200)



Backstand Idler

THE TOOL ENGINEER

AMERICAN

Aircraft Motors

SET THE PACE . .

Aircraft manufacture—America's No. 1 industry today! Making the best, the fastest, the hardest hitting planes ever built—and more of them! Beating quotas and schedules — setting a new pace for fast and precision production. » » » And right in step — Wesson Carbide Cutting Tools establish new standards for cutting tougher metals, faster — with precision and perfection never before attained.

Wesson leadership, recognized in aircraft motor production, will meet the challenge of new and finer "tooling up" for post-war production.

The counsel of Wesson engineers — skilled in engineering and designing of cutting tools — is available to help solve present war production problems, or for post-war planning.

WESSON CO., DETROIT, MICH. (Ferndale Station)



WHEN IT'S OVER "Over There" we'll all have a higher standard of living "over here." Better vacuum cleaners, refrigerators and washing machines—better cars, trucks, planes, bicycles — better tractors, plows and other farm machinery. Industrial plants will have better tools and better machines.

They will all serve better, last longer, cost less and be safer. One important reason is that Wesson Carbide Cutting Tools will enable the manufacturers of all these products to use more durable, tougher metals — insure greater precision and perfection — and at the same time cut costs by saving production time.

★

ARE YOU

in the
MIDDLE



on TOOL ENGINEERING?

Is the production department "crying" for jigs, fixtures, gauges, etc. on "those recently completed blue-prints" — or the front office repeatedly asking you to "get going on that proposition discussed weeks ago" — while you and your department are up to your eyebrows in other pressing work?

You can place much of this responsibility upon McKinney as many outstanding manufacturers have done repeatedly.

This organization of several hundred specialists will: design tooling to your blueprints and build them, if desired—produce jigs, tools, etc., to your completed designs—and in some instances produce the precision parts in our completely equipped plant.

A bulletin explains our services and facilities. Write for it, or better yet, ask a McKinney representative to call and discuss your particular needs.

McKINNEY
TOOL & MFG. CO.
CLEVELAND

DESIGNERS and BUILDERS
of PRECISION TOOLING
Since 1920
1671 ARABELLA ROAD

Tools • Dies • Jigs • Fixtures • Special Machinery

—NEW EQUIPMENT—

HARDENING SOLUTION

The Steeltem Chemical Co. announces that its new hardening solution called Steel-temp, definitely simplifies heat treatment of tools and steels

INFORMATION FREE

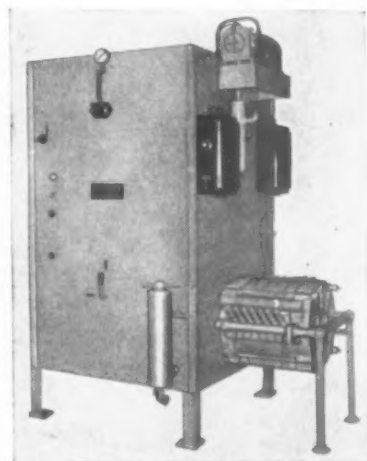
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

and improves the pearlite texture of the steel grain.

According to the company, the solution hardens the cutting edge of any tool steel beyond the point obtainable by ordinary quenching methods and prolongs the life of all types of edge tools. It is stated further that tools quenched in this medium stand greater punishment and need fewer grindings.

LUBRICANT RECONDITIONER

Hilliard Corporation announces that new units recently added to its line of Airline Oil Purifiers are particularly well adapted to purifying oils used in



Hilliard Oil Purifier

vacuum pumps, hydraulic presses, air compressors, and many other pieces of industrial equipment.

In operation, the unit draws oil into a heater tank into which is introduced a highly efficient grade of fuller's earth or activated clay. The mixture is thoroughly agitated and heated to drive off all traces of water, moisture, or dilution. All solids such as carbon, tarry matter, abrasives and acids are absorbed. The mixture is then forced by compressed air into a filter press where all solids are retained.

DIAMOND-BONDED ABRASIVE WHEEL

Industrial Abrasives, Inc., has developed a new line of diamond bonded wheels, known as "Super-Cut".

According to the company, a new secret bonding process gives the wheels an unusually long life by setting each individual diamond solidly and uniformly in a special metal, assuring both fast cutting and long life. The company has recently completed observing and tabulating tests in war plants and machine shops.

THE END

THE TOOL ENGINEER

Plan your Post-War *Costs*, too!

Of course, you are planning your post-war products. Thinking about post-war re-employment, too. But, how about production costs? Unless your plan embodies ways to keep costs in line, neither your products nor your re-employment will get very far.

Let Lipe Carbo-Matic Lathes help you. Designed and engineered for fast, high-precision production, at a time when costs were still the controlling factor, Lipe Carbo-Matics will lower your unit costs, lower your tool costs, lower your spoilage costs and lower your labor costs. Investigate now. Ask for production performance and cost records.

Line Carbo-Matics are fully automatic. Hydraulic holding equipment, feeds, tailstock quill. Swing over bed 15", over carriage 8", between centers 30".

**LIPE - Rollway
Corporation**
Syracuse, N. Y.



LIPE *Carbo-Matic* LATHE



**PARLEC UNIVERSAL
DRILL JIGS**

More production with Less Man Hours!

- ★ Saves Tool Designers' Time
- ★ Saves Tool Makers' Time
- ★ Saves Production Time

Made of Nickel Iron normalized with Jig frame and cover finished top, bottom and both sides. Base is not finished. 5 Standard Sizes! Special Sizes and Heights on Request.

Manufactured and Sold by

EARL C. PARKHURST
751 E. Stepney Pl., Inglewood, Calif.

dependable performance with



Janette
D.C. to A.C. CONVERTERS

UP to 3.2 K.V.A.

When only D. C. power is available, ELECTRONIC DEVICES requiring from 110 to 3250 volt-amperes A. C., can be operated by a rugged Janette rotary converter. Many thousands of such essential safety and other electronic devices, used on ships and shore stations, depend upon Janette converters for power.

Wherever there are ships, you will find Janette converters.

Janette
Janette Manufacturing Co. • 556-558 W. Monroe St. • Chicago, Ill.

ARMSTRONG



**Do the same work with
1/10 the High Speed Steel**

Stop wasting critical High Speed Steel by using forged tools for work that can be done more efficiently with a few ARMSTRONG TOOL HOLDERS. Each ounce of high speed steel in an ARMSTRONG TOOL HOLDER will do the work of 10 ounces in a bar tool. With single ARMSTRONG TOOL HOLDERS replacing complete sets of forged tools, the large amounts of high speed steel tied up in cumbersome single-purpose solid tools or wasted in heavy tool stumps can be saved.

ARMSTRONG TOOL HOLDERS are the most efficient tools obtainable, with correct cutting angles, maximum tool clearance, extreme rigidity and strength to stand up to any speed or feed. Use them for every operation on lathes, planers, slotters and shapers and for many operations on engine lathes, turret lathes and screw machines to "SAVE: All Forging, 70% Grinding and 90% High Speed Steel."

Armstrong Bros. Tool Co.
"The Tool Holder People"
380 N. Francisco Ave., Chicago, U.S.A.

Eastern Warehouse & Sales:
199 Lafayette St., New York

LAPPING COMPOUND*

Grade No. 38-900A

A NEW compound with a NEW abrasive sharp enough to lap and polish hardened materials, nitrided, Chrome plate, etc. Gages, Dies, Aviation parts—yet fine enough for the final finishing.

This compound has a special heavy oily paste base especially made for dilution with spindle oil, kerosene, sperm, etc.

**LAPPING
LUBRICANT**

No. **LMKT**

A sperm oil substitute
Available in gallon lots

**WRITE
FOR
SAMPLES
IN
GLASS JARS**

HAND — PLATE — MACHINE LAPPING
United States Products Co.

518 MELWOOD ST.

PITTSBURGH, PENNA.

* Recommended by Norton Company for use on their Lapping Machines

THE TOOL ENGINEER

Producto MODERN MACHINE Vises

There are no Vises that compare with PRODUCTO Vises.

These superior and modern Vises are so much better than the conventional design. Bodies fitted with hardened and ground wearing plates — extra large opening between jaws — large screw and nut for movable jaw — make these 4½" and 6" Vises practically indestructible and useful for very long wear.

We also make Cam Lock Vises in 4", 5" and 7" sizes for production milling and drilling operations. Best vise for this purpose.

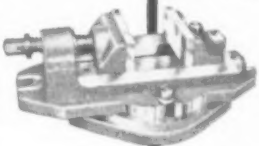
Don't bother with old tools — use Modern Machine Vises.

Ask for 8-page circular—

Also manufacturers of Producto Die Sets and Die Makers' Accessories.



6" Heavy Duty General Purpose Vise



4½" Swivel Vise for tool rooms and machine shops



6" Heavy Duty Swivel Vise

The PRODUCTO MACHINE COMPANY

940 HOUSATONIC AVE.

BRIDGEPORT, CONN.

3017 MEDBURY, DETROIT, MICH.



B.S.

High Rifle Output Depends on Pumps

to maintain uninterrupted hydraulic operation of rifling machines. Brown & Sharpe Motor Driven Rotary Geared Pumps were chosen for this vital war need because of unfailing performance

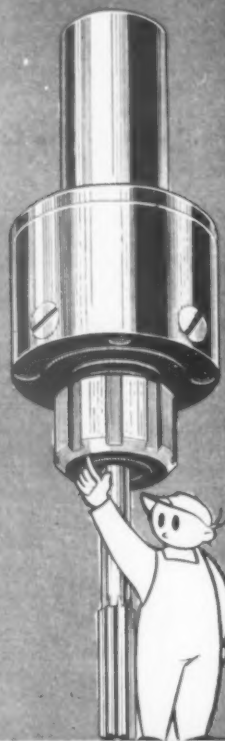
Motor Driven Rotary Geared Pumps as well as other Geared, Vane and Centrifugal Pumps, are shown in our pump catalog. Copy forwarded upon request. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

BROWN & SHARPE PUMPS

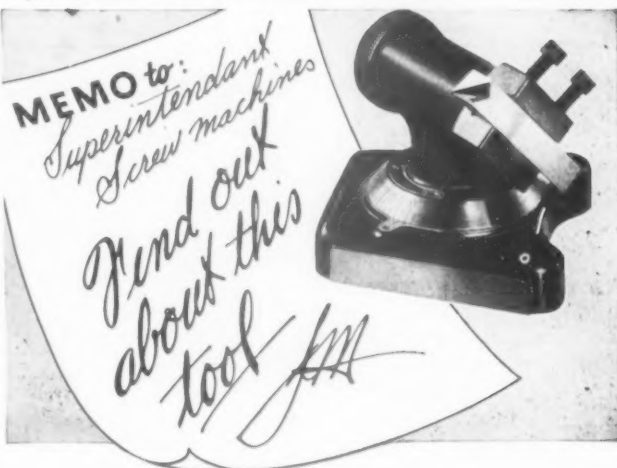
DECEMBER, 1943

UNIVERSAL FLOATING CHUCKS.

Universal Floating Chucks are the ideal tools for drilling, counter-boring, reaming or piloting from a lead hole. Adjustable spring pressure compensates for tool weight, allowing increased feed without danger of marred holes. Designed for horizontal operation in screw machines and turret lathes. Write for facts on Universal Floating Chucks, Standard Chucks and Centering Chucks.



UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN



UNIVERSAL GRINDING FIXTURE FOR SCREW MACHINE TOOL BITS by BOYAR-SCHULTZ

Increase the efficiency of screw machines and reduce costly rejections. Inexperienced operators using Boyar-Schultz Universal Grinding Fixture, can produce uniformly ground tool bits for both right and left hand tools, all with exactly the same chip breaker, ground to any desired angle, and to suit any specific material or condition.

Saves time and material in grinding. Uniformly ground bits save time in set-ups.

BOYAR-SCHULTZ CORPORATION
2116-M WALNUT STREET CHICAGO 12, ILLINOIS

NEW LITERATURE

T. M. REG. U. S. PAT. OFF.

OF INTEREST TO PRODUCTION EXECUTIVES

(900) Metal Working Machinery

W. F. and John Barnes Co., Rockford, Ill., has just published a 50-page loose-leaf data book, entitled **Special Machine Tools**, which is available to plant managers, superintendents, production managers, foremen, and others who have a voice in the selection of new plant equipment.

Because of the expensive nature of the publication, requests for the book must be sent directly to the Barnes Company on the firm letterhead of the person making the request.

The data book is divided into 6 sections namely: Multiple Drilling and Reaming Machines, Boring and Facing Machines, Milling Machines, Deep Hole Machines, Miscellaneous Machines, and Data Sheets. The book is excellently done in color with photographs and diagrammatic drawings. The various Barnes machines are pictured, accompanied by text giving the name of the machine and the model number, the particular part on which it is used, and the operation or operations which it performs.

(901) Grinders

Norton Multipurpose Grinder. This two-color folder shows pictorially all the features of the universal grinder

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made by Norton Company. Also included is a list of specifications showing capacity, headstock, foot stock, wheel head, wheel spindle, wheel feed, sliding table and traverse speeds, motors, floor space required, and shipping specifications.

(902) Speed Mechanism

Fluid-Screw Rigidmil. 18 pp. Sundstrand Machine Tool Co. This book describes the outstanding features of this company's hydraulic transmission control of a machine table screw to provide a feed method having all the advantages of both hydraulic and mechanical feed without the disadvantages.

It lists features of the control, and discusses cuts and cycles, specifications, floor plan dimensions, shipping weights and dimensions, typical operations on standard machines, and special applications.

(903) Cutting Oil

The 577th Oil. This 16 pp. booklet published by D. A. Stuart Oil Co. features twenty-two short stories on how proper cutting fluids have solved production problems in war plants manufacturing products ranging from tanks to hypodermic syringes.

Also included in the book are tips on prolonging tool life and a chart for adapting sulpho-chlorinated oils to various metal-working operations, tools, and metals.

(904) Gaging

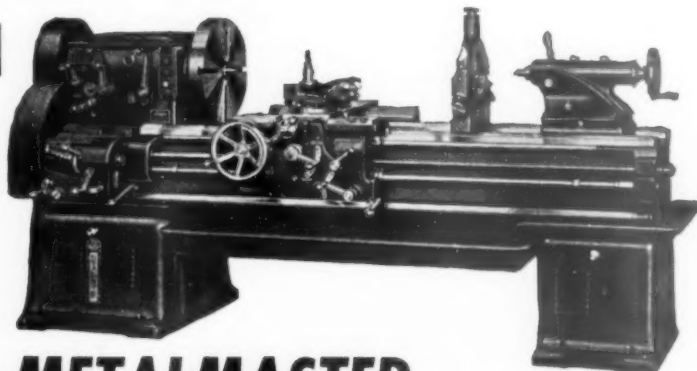
Bartelt Pedestal Micrometers and Pedestal Indicators. Various applications of the Bartelt Engineering Company's gaging equipment are outlined in this four-page bulletin. Special adaptations of each model made by the company are also included together with specifications and prices.

(905) Tools

Jarvis Power Tools, 60 pp. Charles L. Jarvis Co. This new large catalog lists the complete line of Jarvis tools, including flexible shaft machines of various kinds, flexible shafting, tapping attachments, quick change chucks and collets, and ground-from-the-solid high

(Continued on page 206)

PRODUCTION AND PRECISION



THE METALMASTER

is engineered to give you the measure of production and precision you look for in a top-notch lathe. All the rich experience of a hundred years of machine building works for you in this lathe.

● **Production** is assured by such features as 12 forward and reverse speeds in geometrical ratio and a wide-range quick-change gear device.

● **Precision** is constant because of high carbon molybdenum steel spindles that are precision-ground and that run in perfect balance.

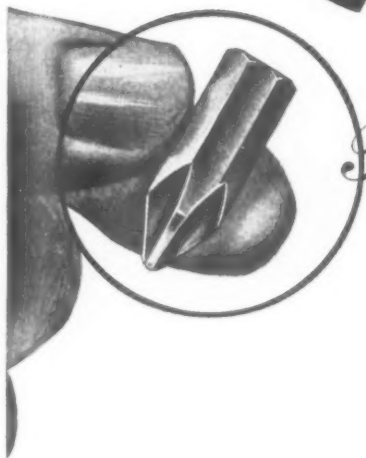


ALSO MANUFACTURERS OF DRILLING AND TAPPING EQUIPMENT



THE BRADFORD MACHINE TOOL CO.

EVANS STREET SOUTH OF EIGHTH CINCINNATI, OHIO
PRECISION TOOLS SINCE 1840



This little bit does 4 big jobs on Phillips Screws

Here's a brand new twist in power screw drivers: Apex insert type bits. And they are ready to go to work for you right now on practically any type of power driver in use today. They'll save in these important ways:

Saves Money

Apex insert type bits cut down the many different sizes of Phillips bits usually needed. Once you've bought the holders you need,

you carry only the insert tips. One range of inserts fits various sizes of holders.

Saves Steel

Apex insert tips are small, release vitally needed steel for other war uses.

Saves Replacements

Insert bits last longer because the float between the holder and insert permit eas-

ier direct alignment with recess in screw.

Saves Handling

It's no longer necessary to return used driver bits for reconditioning. Cost of new inserts amounts to approximately the same as reconditioning charges.

Get the whole line-up on these thrifty, time-saving Apex bits, and the holders to fit practically all makes of drivers. Write for Bulletin **102**

APEX

THE APEX MACHINE & TOOL COMPANY • DAYTON, OHIO

speed steel rotary files. The book is well illustrated and text is complete with drawings and tables.

(906) Production Machinery

Gisholt Machines. 32 pp. Gisholt Machine Co. This new three-color 32-page catalog portrays the entire line of Gisholt products including turret lathes, automatic lathes, and balancing machines.

It does not attempt to include full technical data on all Gisholt machines, attachments, and tools, but does show in concise form the various types and sizes of machine tools available. Also the book lists Gisholt engineering services and manufacturing facilities

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and shows typical special machines developed to meet specific and unusual tooling problems.

(907) Grinding Wheels

Universal Grinding Wheels. 70 pp. Universal Wheel & Abrasive Corp. This new catalog enables users to visualize at once the wide range of types of grinding wheels available from this

company. It shows cross sections of nine standard types which are representative of practically all grinding wheels used on the standard makes of grinding machines.

(908) Industrial Salvage

Salvage Manual for Industry. Prepared by the Technical Service-Section, Industrial Salvage Branch of the Salvage Division of the WPB, this 245-page book contains extensive information on industrial salvage.

Various chapters deal with organizing and planning a salvage department; administrative factors; methods of handling metal scrap, non-metallic waste, and practical hints for handling specific waste material. Copies are available from The Superintendent of Documents, Government Printing Office, Washington, D. C. at 50c each.

(909) Profile Measurements

Type Q Profilometer. Physicists Research Co. This 8-page booklet discusses the practical measurement of surface roughness.

It describes the Profilometer made by the company for production measurement of surface roughness, and lists accessories available for the instrument.

(910) Carbide

Norbide Boron Carbide. 8 pp. The Norton Co. This booklet discusses Norbide, a boron carbide substance which the company says is extremely hard.

Included are discussions of plug gages, ring gages, snap gages, radius gages, keyway gages, gage blocks, inserts, micrometers and indicator points. Other information contained in the book deals with care of diamond wheels, typical mountings in hollow norbide cylinders, and a comparative table of physical characteristics of materials commonly used in the manufacture of gages and other measuring devices.

(911) Heavy Machines

Giddings & Lewis has published a new catalog describing its "50 Series" planer type, high-power, precision-horizontal boring, drilling, and milling machines. In addition to complete description and specifications, it contains a table of optional working ranges.

(912) Abrasive Wheels

"MX" Wheels. This 8-page booklet describes the new line of "MX" wheels developed by The Carborundum Co.

It contains information on grades available, uses of recommended gradings, a table of list prices for various size wheels, and a general discussion on the principal uses for which the wheels are intended.

(913) Production Calculator

W. O. Barnes Co., Inc., has issued a hack saw production calculator, designed to show the time necessary to make cuts with power hack saws in various steel specifications.

SAE, AISI, and AMS specifications of steel are listed together with machinability factor of the steel. When this factor is set up on the slide, together with the size and shape of the bar or nest of stock being cut, the time necessary to make the cut on the material being used is easily determined.



Even while your plant is producing war equipment on an all-out basis, your engineering department is probably designing equipment right now for the post-war market — equipment with vital parts that must be safeguarded by a wise selection of metal.

For parts subject to wear, impact, or other severe mechanical service, select Ampco Metal, an alloy of the aluminum bronze class. Its successful use by over 2000 companies in thousands of applications proves its ability to stand up under gruelling conditions — to give that "extra", so important to continuous trouble-free service.

Ampco Metal gives several times the service of ordinary bronzes, as available case histories prove. It's the bronze that assures you satisfied customers, and the prestige that accompanies built-in quality. Build it into your new equipment and assure yourself parts that are a credit to yourself and your organization.

"File 41—Engineering Data Sheets" gives technical details and case histories. Ask for this free bulletin. Invite an Ampco Field Engineer to advise you on your bronze problems. No obligation.



AMPCO METAL, INC.

DEPARTMENT TE-12

MILWAUKEE 4, WISCONSIN

**AMPCO
METAL**

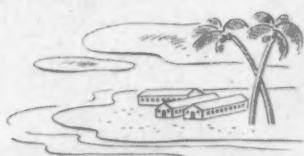


AMPCO

THE METAL WITHOUT AN EQUAL

You can bank on **EGYPTIAN FINISHES**

for
Steel Fabricated Buildings
for
Any Task-Force Structure



ANYWHERE



Picture of a hospital going somewhere.

OFFICIAL U. S. NAVY PHOTO



OFFICIAL U. S. NAVY PHOTO

Above . . .
Here it is, set up
and operating . . .
where it's needed.

•
An entire hospital
unit of steel fabri-
cated buildings . . .
overseas.



OFFICIAL U. S. NAVY PHOTO

Are you making steel fabricated task force building assemblies? If so, let us help you with your painting problems. We know your specification requirements.

Egyptian Finishes are giving complete satisfaction on hundreds of such buildings now in service on all the far flung fighting fronts of the world.

Egyptian Finish, for steel fabricated task force buildings, can be applied by dip, spray

or roller coating method. It dries quickly for handling and packing with a minimum of special equipment.

This is but one of the many finishing problems with which we can help you. Today, Egyptian service to you is definitely two way: 1—it covers the war products you are now making; 2—it covers the peace products you'll be making in the post war period to come.

★ ★ ★
Special correspondence on finishing problems is invited.

THE EGYPTIAN LACQUER MANUFACTURING COMPANY

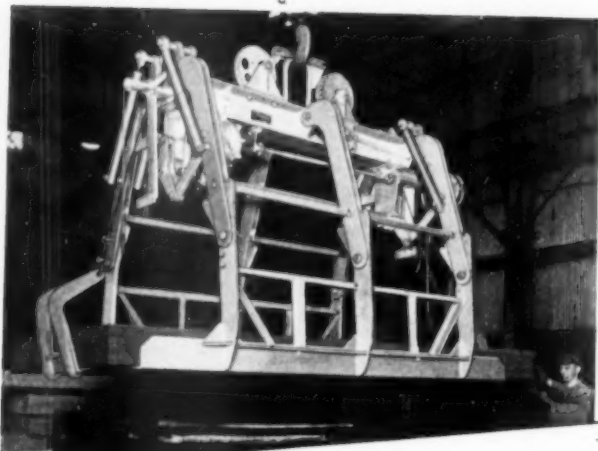
ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Egyptian's new U. S. Government "Spec" Book—4th Edition—is ready. It's helpful and it's FREE. Send for your copy. Please address
Dept. E-12



EGYPTIAN

SUPERIOR FINISHES



Handle the largest
and thinnest
sheet stock

easily and
safely!



With a C-F Sheet Lifter 1 man can handle the thinnest stock or longest strips quickly and easily —can pick up loose or bundled sheets, carry them safely and stack them closer and higher without slipping or sliding, bending or kinking, without denting or rippling edges.

C-F Sheet Lifters are made in a wide range of sizes and types; for any cranes, monorail or hoist; for any headroom or working situation; in capacities from 2 to 60 tons. All have patented "elbow" arms. All are accurately balanced and counterbalanced and are easily operated by 1 man . . . with hand chain or motor control.

Write for Bulletin SL 21

CULLEN-FRIESTEDT CO.

1318 S. Kilbourn Ave., Chicago, Illinois

EVEREDE SPECIAL BORING BARS ★

MADE TO SPECIFICATIONS
with EVEREDE Triangle Bit

Micrometer adjustment with indicator dial on wrench. Assuring accuracy regardless of bit angle. Furnished with solid bits of Tungsten carbide "Stellite" or High Speed Steel.



READY FOR
CUTTING.
NO FORMING OR
GRINDING NECESSARY.

Write for Folder

EVEREDE BORING BAR HOLDERS



Adjustable to
fit various size
lathes

Are adjustable to fit various size lathes. (Bushings are furnished with each boring bar for use in the Holders.) Everede Holders keep the boring bar in a horizontal position, regardless of any change in the size of the lathe, within limits. • The No. 1 Holder for lathes from 7" swing to 9". • The No. 2 Holder for lathes from 9" swing to 12", and the No. 3 Holder on engine lathes from 12" swing to 24".



EVEREDE BORING BARS

The ONLY Boring
Bars with the
Economical
Triangular Bit.

Made of finest nickel steel, heat treated, uses a H.S. Steel or solid Tungsten bit. Bit cuts ahead of the bar and allows boring of a hole right up to the shoulder. Designed for rigidity and adaptability to all uses. Bars for lathe boring range from 7/32" to 3/4". From 7/32" to 3/4" with precision ground shanks for jig boring.

EVEREDE TOOL CO.

WILLIS STUTSON
184 N. WACKER DRIVE, CHICAGO 6, ILL.

—NEW LITERATURE—

(914) Sanding Machines

The Sterling 1000 New Electric Portable Sander. Sterling Tool Products Co. Features of this manufacturer's portable sander are outlined in this two-color folder. It pictures the cartridge-type air filter, pad attachment lock, and other features of the machine.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

(915) Metal Refrigeration

Metal Chilling Data Book. 24 pp. Deepfreeze Division, Motor Products Corp. This new 24-page technical data and operating manual gives authentic information on the subject of cold treatment of metals.

It offers authentic information and technical data on the application of Deepfreeze industrial chilling machines for shrinking, testing, hardening and stabilization of metals.

Many typical applications are described showing the savings and increased production resulting from the use of chilling equipment.

(916) Engineering Service

4 Spheres of Service. Merz Engineering Co. Available to executives in metal working and manufacturing industries, this portfolio outlines and describes the 4 general fields in which Merz engineering service is available.

This literature covers the company's equipment and facilities for designing and research engineering; for the manufacture of standard, plain and threaded, plug and ring gages; for designing and producing all special types of gages, tools, and fixtures for industry; and for the precision manufacture of metal parts and products on a volume basis.

(917) Welding Positioners

Welding Positioning Equipment. 4 pp. Ransome Machinery Co. Known as No. 201, this bulletin presents in condensed form information on the Ransome line of welding positioners. It includes specifications, important features, dimensions, and rating tables.

(918) Compressor Calculator

Designed to save time in computing compressor requirements or in estimating performance of present units, a new slide rule type calculator is being offered by Cooper-Bessemer Corp.

Of handy pocket size, it may be used for estimating volumetric efficiency, brake horsepower, and total piston displacement of any brand compressor.

(919) Gear Shaping

No. 4 Fellows Fine-Pitch Gear Shaving Machine. This illustrated 4-page folder published by The Fellows Gear Shaper Co., is a complete description of the design and operation of the new No. 4 fine-pitch gear shaper.

It covers the function of electrical control push buttons, setting up and operating the machine, setting tool head and stroke length, selecting traverse feed and depth feed cam gears, setting the work to the tool.

(Continued on page 210)

**AVOID
EXCESS TOOL
INVENTORIES**



**Keep up Production
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use **TECO** *Cemented Carbide!*

Because of the remarkably long-wearing qualities and long-run production of TECO Cemented Carbide, many plants are able to hold tool inventories at much lower levels than ever before.

The answer is simply that each TECO Cemented Carbide tool does so much more work . . . fewer tools are needed. And, as a result, fewer idle tools are tied up, releasing vitally needed carbides for other war plants.

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longer because it is harder, denser, more uniform . . . thus more resistant to wear and breakage. It holds cutting edges and maintains accurate tolerances for longer runs, under high speed production.

We can make dependable delivery on grades, styles and sizes of TECO Cemented Carbide Tools and Blanks for practically every machining operation. Have one of our tool engineers discuss your requirements. Write for detailed catalog.



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CEMENTED CARBIDE

(920) Cutting Tools

Tantung Tool Catalog. Vascaloy-Ramet Corp. This 24-page catalog, illustrated in color, contains descriptive material on the company's listing of tools available.

Also included is technical performance data, grinding instructions, brazing instructions, screw machine data and the various grades of Tantung.

(921) Induction Heating

Illitron High Frequency Induction Heating. The 6-page folder published by the Illinois Tool Works discusses induction heating in general and describes and illustrates the Illitron high frequency induction heating equipment

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 179.

made by the company.

In addition to the specifications of the machine, electrical matching and rematching are discussed.

(922) Bending

Pipe and Tube Bending Handbook. 80 pp. The Copper & Brass Research Association. Prepared at consumers' requests for authoritative information on

the subject, this handbook covers such subjects as hot and cold bending, minimum radii, temper, the use of mandrels of various types, and many other essential factors. Also included are information on bending with the use of filler material such as sand, rosin, salt and low melting temperature alloys, and step by step procedures for smooth and wrinkle bending of large diameter pipes. The book is well illustrated.

(923) Power Transmission

Speedmaster Engineering Manual. Published by the Speedmaster Company, this 42-page manual discusses the company's double groove, single belt drive variable speed pulley and its operation.

Applications of the device on several kinds of machine tools are included. Engineering data also is given on mounting, belt alignment, minimum center mounting distances, motor mounting, belt lengths, belt tension, belt and pulley speed computation, and maximum power capacities.

(924) Special Machinery

Hydraulic Machinery, Inc., announces two new bulletins describing different models of flame-hardening special machinery and hydraulic presses. Bulletin SM 843 describes the flame hardening and special machinery. The several models of hydraulic presses are outlined and described in bulletin PT 845.



...and remember that CHUCKS are TOOLS

If you break a mirror, that is considered bad luck. But the actual loss is only a piece of glass and it can be replaced. When a critically needed cutting tool or an equally essential chuck is ruined, the loss is not limited to a single unit, hard as it may be even to replace that unit. You also lose the continuing stream of urgently needed war material that tool or chuck could have produced, had it been kept on the job.

All of us have a job to do in seeing to it that tool-power as well as man-power is carefully conserved and efficiently

maintained for maximum output with minimum waste. We are more anxious to help you keep present Cushman Chucks on the job, producing to capacity, than we are to supply you with new ones. We urge you to call every operator's attention to the simple rules of good chuck maintenance that will prolong service life and retain initial high accuracy. These rules have been briefed on small "Chuck Check" cards which we will be glad to supply upon request for distribution in your plant. Also feel free to consult our engineering department freely on any special problems that may come up. The Cushman Chuck Company Hartford, Conn.

Send for these "Chuck Check" maintenance cards today.



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NEW BOOKS

Machine Tool Primer. Herbert D. Hall Foundation. This very excellent book has been written to serve as an introduction to the metal working industry. An outstanding feature of the publication is its easy style and lucid explanations of what machine tools are, what they are used for, and with what other metal working machineries they are associated.

The Machine Tool Primer is divided into two sections. Part one deals with the question of what machine tools are used for. Chapter headings include Things Machine Tools Make, Metal Working Processes in General, Mass Production Explained, Skills in Machine Shops, Fits, Gaging and Inspection, Organizing for Production—Tooling Up, and Efficiency—Time and Motion Study.

Part two, while not a complete technical treatment of machine tool operations, contains excellent information necessary to a full understanding of how machine tools perform, the basic mechanism involved, and how cutting tools work. It deals with drills and drilling machines, metal working lathes, turret lathes and automatic lathes, planing and shaving, milling machines, grinding machines, and press workings of metals.

This book fills an apparent need for an elementary discussion of the A B C's of the metal working industry. It is valuable both for students in technical schools and specialized machine shop training courses and for adults who wish to obtain an intelligent understanding of what machine tools are and what they are used for.

The book is available for \$2 from the Herbert D. Hall Foundation, 1060 Broad Street, Newark 2, N. J.

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HANDY ANDY

Says —

T.M. REG. U.S. PAT. OFF.

MY RECENT diversion into the various "ologies" and neogeography having evoked considerable comment, both written and verbal, I'll conclude the series with such review as rationed space permits.

Starting with the home circle, Roy Bramson regarded one installment with a dubious shake of head. "You know,

Andy, birth control isn't exactly technical."

The heck it ain't! At any rate, it's not the controversial issue it once was, the moralists having finally accepted it under the label of family spacing.

In this connection, one reader accused me of falling for the Malthusian theory of population control. Contend-

ing that there is no overpopulation, my critic implied that all of the world's inhabitants could be moved into Texas with a population density of less than 12 persons per acre. He further held that the agricultural and mineral resources of the Lone Star state alone would suffice indefinitely for the so-encompassed two billion people. Well, let's see.

▲ ▲ ▲

The Hartwick Pines, in upper Michigan, stand as majestic reminders of an "unlimited" lumbering empire that man bankrupted in a few decades. Within comparatively short span, oil wells that nature took eons to stock have been all but depleted in a millionth part of that time.

Now, geologists say that the high grade iron deposits of the Great Lakes are going the way of Michigan's copper lodes. They're petering out.

Fifty million bison—food for an empire!—have been all but exterminated within the memory of living man. The whale is going. Concurrently with a warning of danger to Alaska's vast game reserves, soil conservationists forebode possible domestic famine because of soil erosion. And these are but high spots.

▲ ▲ ▲

No, our resources are not unlimited, and while we can develop new fields as others become exhausted, such diversions often result in economic or civil disturbances.

Everything considered, then, the saturation point of population is not to be gaged by the number of persons per unit of area, but by that point beyond which the mass of a people cannot maintain decent standards of living.

Regarded in that light, population control (or family spacing, to use that term) becomes not only highly technical, since it involves human engineering, but of grave social and economic import as well. So much for that!

▲ ▲ ▲

Bringing the travelogue closer to home, I'm just back from a very pleasant visit to Montreal, No. 50 having invited me to speak at their November meeting. At that, I almost had to renege because of coming down with pleurisy the week before.

However, I made it, thanks to a good doctor, sulfa drugs and a devoted nurse—the Missus—who, incidentally, was adamant in refusal until I'd donned red flannels and all the appurtenances of an Arctic explorer.

But Doc said the diversion would do me good, provided I was careful. I was, and it did. The boys had arranged quite a program for me, but I had to forego that; instead, spent most of my time sleeping which, as the Old Man would say, was almost like being at work.

▲ ▲ ▲

They put me up in what must have been the royal suite, the only thing lacking being the entourage usually associated with a visiting sultan.

Lunched with Art Roszel, whom, from his name and Oxford accent, I took for a Frenchman who had finally surrendered to the British. Then, over the sherry, he started a conversation in fluent Swedish, a language he speaks along with several others. He is a versatile and charming companion with a

(Concluded on page 214)

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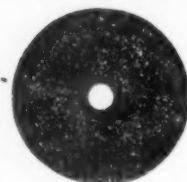
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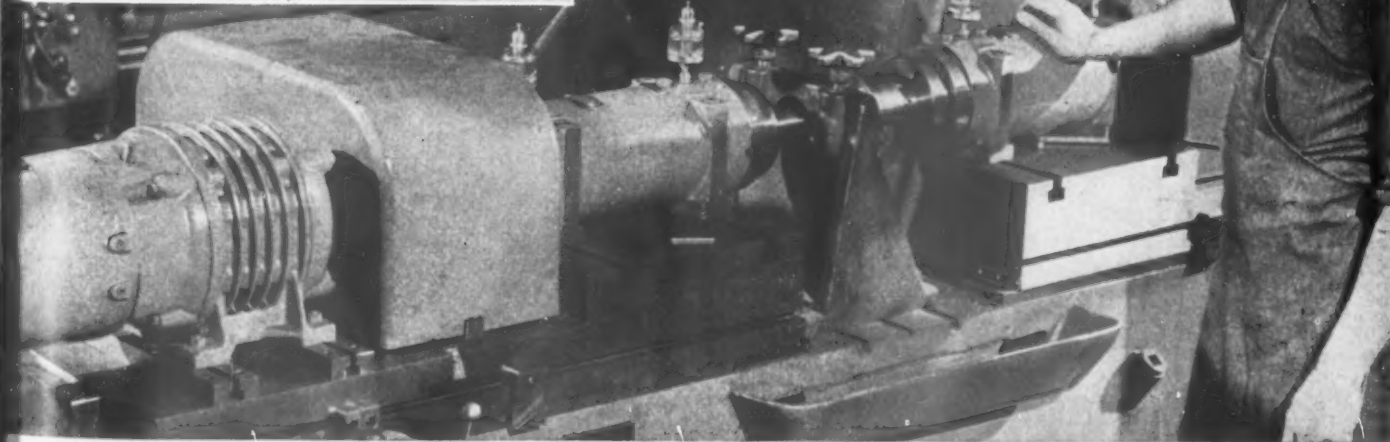
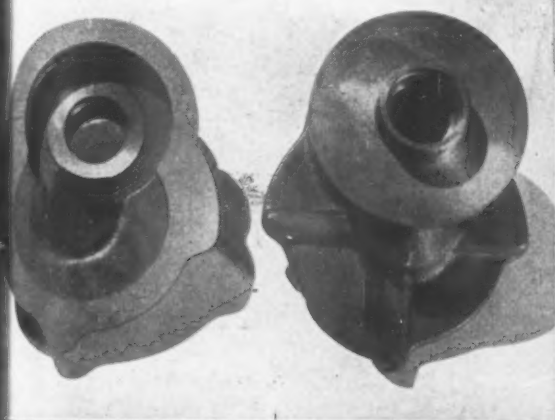
FEED— $1\frac{1}{8}''$ per Minute.

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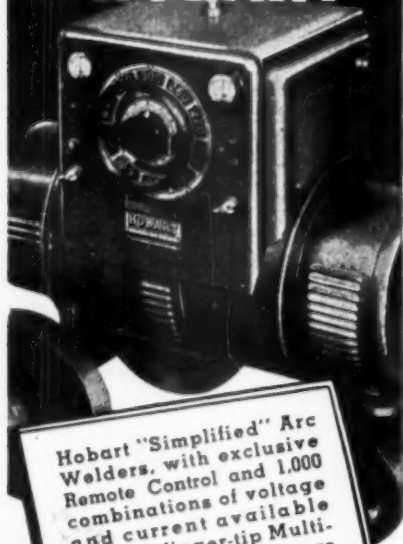
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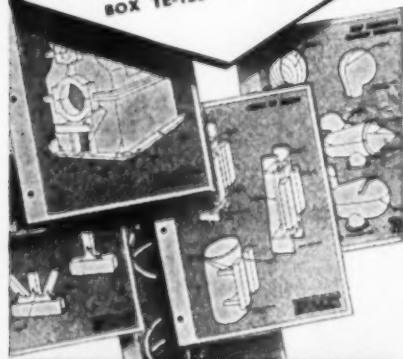
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HANDY ANDY SAYS—

(Concluded from page 212)

bent for philosophy and poetry and, I readily surmised, an excellent engineer with a flair for personnel direction.

Lunch over, he took me up to the Mountain, from whence Montreal in all its beauty unfolded before me. What a place for a convention! Friendliness, an Old World atmosphere mellowing the modern, and beautiful women whose voices come over the phone like the note of a silver chime. (See what hobnobbing with a poet does to a guy!)

Bob Rogers, Herb Gibson, Jerry Rogers and Warren Bowes, chapter officers, dropped in for a get-acquainted social just before the meeting, as did Len Singer, Canadian A.S.T.E. director and several others. A fine group of men. Had expected Prex Morris and Canada's machine tool controller, Thos. Arnold, the latter slated for an honorary membership in No. 50.

Oh, 'twas to be a gala night! But Ray was taken ill, and Arnold had been called into conference with the Dominion's bigwigs. We mutually missed the pleasure of their company. At that, it was a nice meeting, marked with that fine courtesy which seems to be inbred in the Canadians.

Director Singer, who introduced me, gave a very comprehensive resume of A.S.T.E. activities. Certainly, there is no border line between Canada and the States as far as the tool engineers are concerned.

One disappointment I suffered was that I missed coming back to Detroit with Bob Douglas, Montreal ch'man. In my ignorance, I confused Canadian Railways with the Canadian-Pacific. So, we left at the same time, but on different trains. Sorry, Bob! You're a swell guy and I'd have enjoyed your company.

Well, that's all for now, although I'd like to say more. Space is petering out and the Cyclone (my little granddaughter) is distracting my thoughts. (But I like it.)

Incidentally, she is playing with the little toy dog I picked up in Pittsburg some years ago and which brings back rollicking memories of the night the Hounds (in the Pound for the duration) were organized. Remember, gang?

But now, au revoir, and to all of you, North, East, West and South, and to friends and loved ones in the service, a hopeful Christmas and an equally hopeful New Year.

THE END

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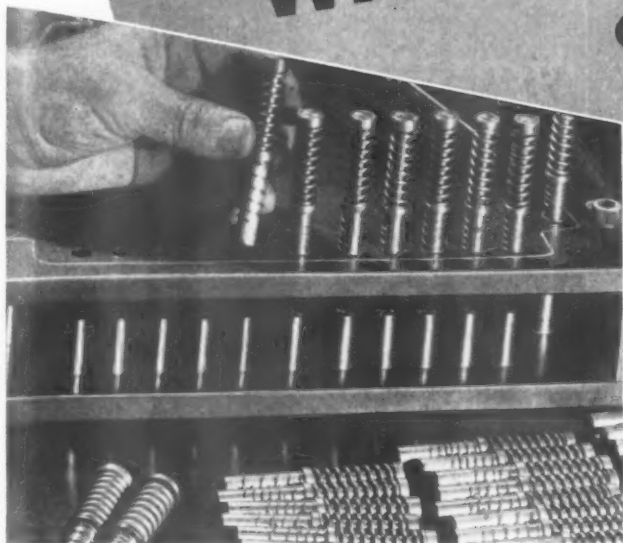
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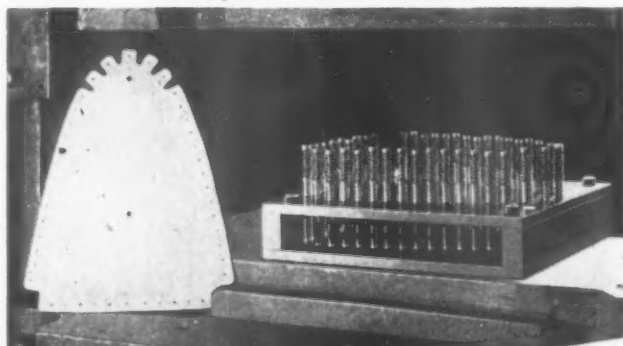
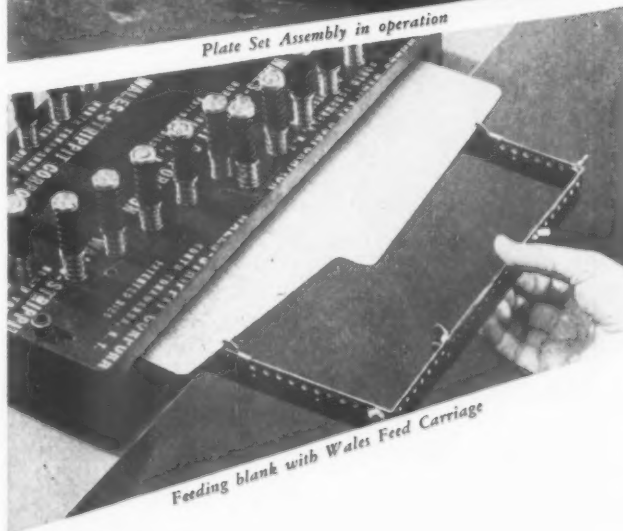


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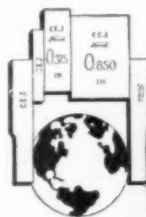
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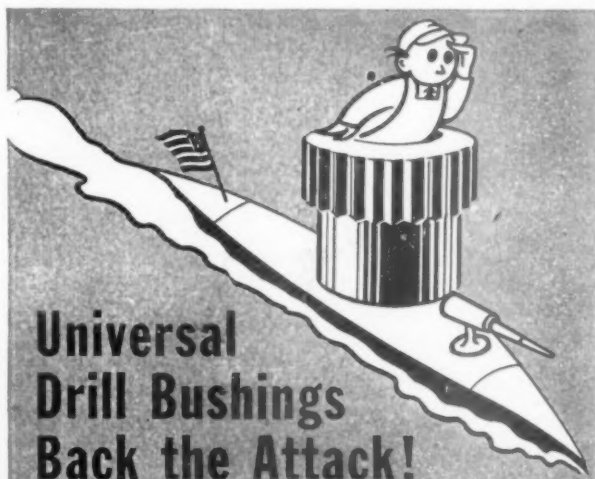
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For application blanks and information pertaining to membership in the American Society of Tool Engineers, address the Secretary's office, 2567 W. Grand Boulevard, Detroit, Michigan. Telephone: TY 50145.

A. S. T. E. DOINGS

Boston: Frank C. Copp, John P. Tierney, and Stanley W. Steadfast, were awarded plaques of appreciation Oct. 22 by Brigadier-General Burton O. Lewis, commanding general of the Boston Ordnance District, at a dinner at the Hotel Gardner.

The plaques were awarded to the men for distinctive service . . . in making a marked contribution through their initiative and ingenuity . . . to vital war production for the conservation of critical materials and machines. In addition to the three chapter members receiving plaques, Arthur B. Kettle, Paul E. Williams, Arthur S. Morse and Albert Wigglesworth also were presented plaques.

Approximately 150 members and guests attended the Nov. 11 meeting at Schrafft's Restaurant. Gadget speaker was J. B. Harrington, superintendent of C & W Tool Co., who talked on "Yankee Ingenuity." Billy B. Van, public relations manager of Fellows Gear Shaper Co. was coffee speaker.

Technical speaker was C. H. Sanborn, also of Fellows Gear Shaper Co. He spoke on "Gears at War." In his talk, he discussed accuracy of the gear blank, roughing and finishing opera-

tions, flame hardening, grinding, lapping, and shaving. He also presented a sound film on development of the gear tooth.

Chicago: Nearly 400 members and guests turned out to hear J. B. Wilkie, gage sales engineer of Pratt & Whitney, discuss "Modern Gaging Practice" at the Nov. 1 meeting held at Huyler's restaurant.

His talk, was amplified by the use of slides and several demonstration gages, and dealt with the rapid and far reaching developments made in gaging during the last few years.

Cleveland: Technical speaker at the Nov. 12 meeting at Hotel Hollenden was J. W. Cable of the Induction Heating Corp. He spoke on "Fundamentals and Application of Induction Heating."

In his talk, Mr. Cable discussed differences between various types of induction heating, spark gap, motor generator, and radio tube. Also on the program was E. S. Conner, physical director of Goodyear Tire and Rubber Co., who talked on "Keeping Up With Living."

Approximately 90 members and guests attended the dinner and 110

more turned out for the technical session.

Columbus: Technical speaker at the Nov. 9 meeting held in the Green Room of Hotel Fort Hayes was F. R. Bonte, representing the Timken Roller Bearing Co. Mr. Bonte gave an interesting lecture on graphitic steels. Tools made from graphitic steel were on display together with several other products made by Timken.

Dayton: Nov. 8 was "National Cash Register Night" at the meeting held at the Engineers' Club. Principal feature of the technical session was the clinic on the problems faced in conversion from civilian production to producing a vital war instrument that normally was custom built by skilled toolmakers.

Discussion was led by J. W. Humphrey, who was assisted by Gunnar Nelson, Walter G. Boswell, Fred A. Shultz, Carl Kalbfleisch, and Edward Herman. Each of the participants discussed a particular phase of production such as engineering, planning and processing, tool design, machining, and inspection. Diagrammatic and pictorial

(Continued on page 220)

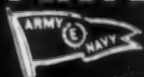


• In the plant of F. H. Robertson, Malden, Mass., manufacturing cutters and precision tools . . . woman operative grinding cutters on an ARTER ROTARY SURFACE GRINDER . . . one of the many important grinding jobs for this machine. Patriotic women war workers are able to take men's places in this work because of the ease of operation and readily available adjustments provided by this versatile grinder.

Many are the precision grinding jobs that are being done by the happy combination of patriotic women workers and ARTERS.

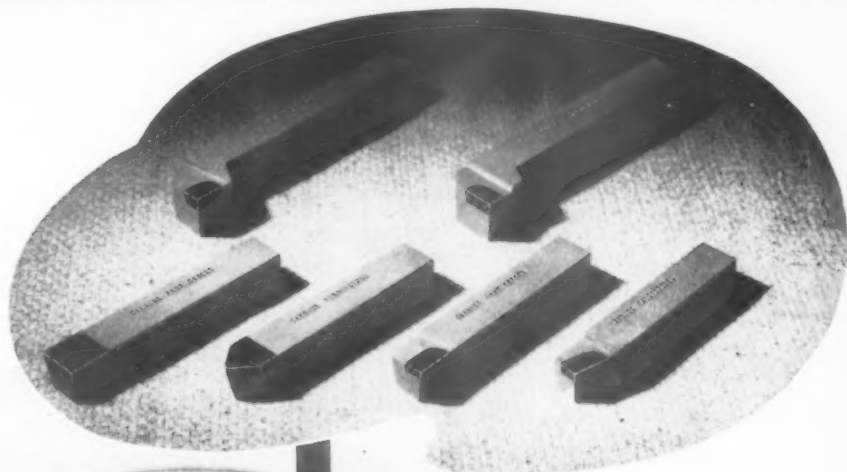
ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.



STANDARD CEMENTED-CARBIDE TIPPED TOOLS

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In 24 to 48
HOURS

If prompt delivery of standard cemented-carbide tipped tools is important to you, Carbide Fabricators can meet any of your current demands. Because of our present production volume, it is now possible to maintain complete stocks in all lines of our standard tools—assurance to you that tools will be in your hands within 24 to 48 hours after your order is received.

The standard tools shown above are ground ready for use to meet almost any requirement for turning, boring and facing jobs. Simplified pricing of these tools makes possible one low unit price regardless of the number of tools ordered.

Also supplied as standard cemented-carbide tipped tools are machine and expansion reamers . . . shell reamers . . . end mills . . . shell end mills . . . shell core drills . . . centers.

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Now PROMPT DELIVERY ON SPECIAL TOOLS

Specially designed cemented-carbide tipped tools are now produced without delay by Carbide Fabricators. On inquiries regarding special tools, it is essential that we have your blueprints to furnish you with full information and prices.



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ROYAL OAK
MICHIGAN

MFRS. OF STANDARD AND SPECIAL CEMENTED CARBIDE TIPPED TOOLS

slides were used to accompany the verbal explanation of basic engineering principles.

The Christmas party will be held Dec. 16 at the Shrine Club. Attendance is restricted to the first 100 couples making reservations and for members only and their wives and friends.

Decatur: Approximately 200 members and guests attended the Nov. 3 meeting at Hotel Orlando.

Technical speaker was Lou Lingler, Research Engineer, Sheffield Corp., who spoke on "History and Theory of Modern Gaging Practice." The talk, illustrated with slides and models, told

the history of standards and covered modern techniques in the application of gages to interchangeability in manufacture.

Detroit: Rear Admiral John Downes, commandant of the Ninth Naval District, and Lt.-Col. R. J. Icks, Army Ordnance, were principal speakers at the Armistice Day meeting in the Rackham Memorial Building. Admiral Downes, speaking on the general war situation in the Pacific warned against unwarranted optimism about the end of the war. He pointed out that tool engineers will play a major role in reconvertng to peace-time production and stated that the task will be even

greater than preparing for war production.

Col. Icks, pinch-hitting for Brig. Gen. John K. Christmas, who would



Chatting at the Detroit Chapter's Armistice Day Rally are, right to left, Bill Fors; Ray H. Farmer; Otto Mueller, Chapter Treasurer; and Captain N. C. Gillette.

not meet his scheduled appointment to address the meeting, discussed the greatly expanded truck program contemplated by the government.

Out of town members are invited to attend regular monthly meetings which are held the second Thursday of each month.

Elmira: Approximately 530 members and guests attended the "Ladies Night" banquet at the Mark Twain Hotel, Nov. 1.

Guest speaker was Thomas H. Beck, president of Crowell-Colliers Publishing Co., who gave a travel portrait of the first Clipper flight to China. His talk contained descriptions of incidents and people met on the trip. Also on the entertainment program was Clyde Powell, personnel director of the Endi-



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and You'll Want No Other!

INVESTIGATE

A broad statement? Yes. But soundly founded on facts—the experience of numerous large manufacturers—the actual performance records of the machines, themselves—and fundamental superiorities of design and construction.

Larger wheels (24" diameter on the standard models) provide greater traction, faster, straighter cutting, more production. Transmissions, common source of die saw grief, never fail in TANNEWITZ DI-SAWS. Sturdier, heavier construction throughout, plus many refinements of design, make these machines the greatest, trouble-free producers in their field. It pays to buy the best!

With a TANNEWITZ DI-SAW you can do in minutes jobs which require hours by the shaper, miller or lathe methods.

Get the complete facts. Just write for DI-SAW bulletin.

On request: Bulletins on Single and Variable Speed Foundry Band Saws; Sheet Metal Cutting Band Saws.

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STANDARD MODEL No. M24
(24" WHEELS)

Other Models to Handle Work of Practically Any Size

Made with 30", 36", 48" and even larger throat capacities if desired, the TANNEWITZ "Big Bertha" models make available the tremendous savings of inside and outside sawing, filing and polishing on dies, jigs and other work of practically any size. Write for bulletin.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.



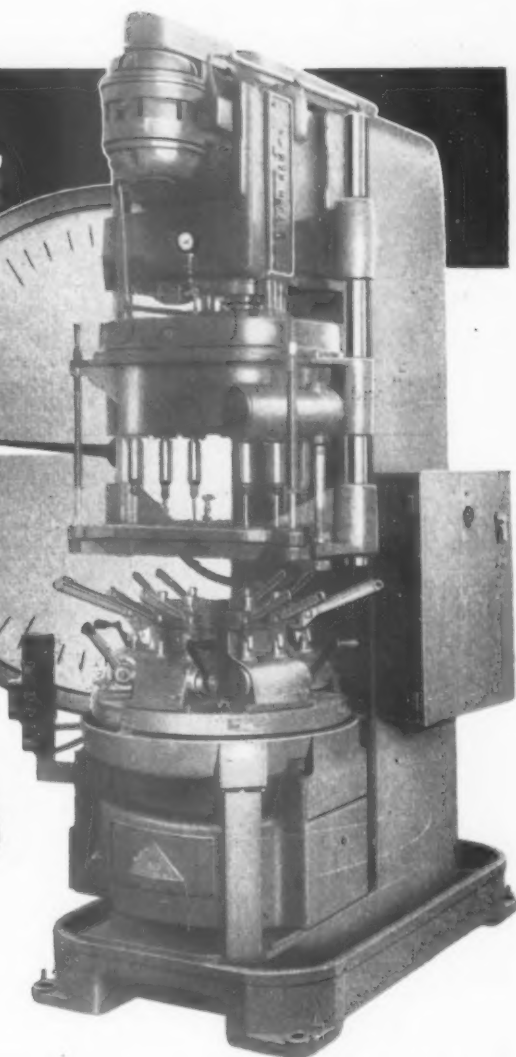
Regular meeting place of the progressive Elmira Chapter is the local Mark Twain Hotel, where this plaque now hangs in the lobby. It reads, "Elmira Chapter No. 24 meets first Monday of each month."

cott-Johnson Corp., who presented a magicians act of excellent calibre. Also announced at the meeting was the New Years' dance to be held at Hotel Mark Twain. Plans so far are not complete but reservations are being accepted.

Fond du Lac: H. E. Linsley, public relations director of Wright Aeronautical Corp., was one of two technical speakers at the Nov. 12 meeting held at Manitowoc.

(Continued on page 222)

4 WRENCHES A MINUTE



Holes for the sliding jaws on these 4-inch adjustable wrenches are drilled and reamed on this specially designed and built LeMaire Machine at the rate of 240 an hour.

This machine is composed of a standard LeMaire No. 5000 Twin Ram Hydraulic Power Unit supported by a vertical column mounted on a heavy cast iron base.

The unit has a 10-spindle drilling and reaming head which provides infinitely variable speeds for drilling holes in wrench sizes of 4", 6", 8", 10", and 12".

A six-station automatic index table, carrying fixtures for quick loading and unloading, is set

for drilling 2 pieces at each of 5 stations and finishes the cycle by reaming at last station with accelerated spindles.

Production ranges from 240 pieces per hour on the 4" size to 80 pieces per hour on the 12" size.

This setup illustrates the versatility of the Twin Ram Hydraulic Power Unit and suggests how standard units can be combined to make a highly productive machine—another example demonstrating how an otherwise complicated production problem is transformed into a simple one through the help of LeMaire engineering.

We're ready to help you, too.

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WAR BONDS**

LeMaire TOOL & MFG. CO.

2663 S. TELEGRAPH ROAD



DEARBORN, MICHIGAN

ENGINEERS AND BUILDERS OF PRODUCTION MACHINES

He spoke on "Production of a 14 Cylinder Wright Cyclone Aircraft Engine," accompanying his address with a motion picture showing production methods used a year and a half ago and a second film showing production methods now used in Wright plants. Also on the program was Dr. H. A. Frommelt, director of industrial research, Kearney and Trecker Corp., who spoke on "High Speed Production Milling in Western Aircraft Plants Using Carbide-tipped Cutters."

Fort Wayne: Principal technical speaker at the Nov. 10 meeting was Harry H. Gotberg, chief engineer in charge of machines and tooling design at the

Colonial Broach Co. He spoke on "Modern Broaching Methods." Also on the program was Paul R. Swift who gave a very interesting and amusing chalk talk.

E. H. Vogel, vice-president in charge of sales for the Farnsworth Television and Radio Corp., was coffee speaker at the Oct. 13 meeting held at the Chamber of Commerce Building. He gave a 20-minute talk on "Expediting." Technical speaker was Walter R. Buerckel, factory representative of the Nicholson File Co. His talk on "Files" accompanied by photographic slides covered in detail the early history, ancient and modern treat methods of manufacture analysis and heat treating of file steel.

Golden Gate: Principal feature of the technical session at the Oct. 15 meeting held at the Engineers Club in San Francisco, was the special showing of two films produced by the Walt Disney studios under the direction of the Bureau of Aeronautics with the cooperation of all major aircraft manufacturers in the United States.

The films, both of which were very comprehensive and up to date showing many operations in the manufacture of airplanes, were entitled "Blanking and Punching" and "Bending and Curving."

Greater New York: A. R. Kosma, president of the Institute of Motion Analysis and author of the book "A B C of Motion Economy," addressed the regular monthly meeting held Nov. 1 at the ballroom of Hotel New Yorker.

Kosma spoke on "Motion Study as applied to tools and fixtures." The talk, which was supplemented by slides and motion pictures, brought out many interesting facts for the tool engineer to consider in designing.

Hamilton: H. M. Huffman, field service engineer for Cincinnati Milling Machine Co., was guest speaker at the Nov. 12 meeting at the Iroquois Hotel, Galt, Ontario.

Mr. Huffman gave an interesting talk on "Cutter Sharpening Practice," using slides to illustrate his lecture.

Hartford: Bill Jack of Jack and Heintz Company was principal speaker at the Nov. 1 meeting held at the City Club in Hartford.

He spoke on "How Jahco Achieves Production." He reviewed his background and experience, and discussed the men immediately associated with him. He then proceeded to discuss how he operates, functions of management in his organization, why he thinks it works, and why he thinks it will work anywhere else.

Guests at the meeting were national A.S.T.E. President, Ray Morris, Past National President Frank Curtis, and Second Vice-President C. V. Briner.

Indianapolis: Main speaker at the technical session at the Nov. 4 meeting was John R. Newland, apprenticeship standard examiner of the War Man Power Commission.

He spoke on "Apprenticeship Develops Trade Judgment—A Vital Factor in Tool Development." He stated that post-war apprenticeship training should be drawn from returning veterans, especially those who had already started training before entering the war.

Kansas City: Coffee speaker at the Nov. 3 meeting held at Fred Harvey's Pine Room in the Union Station, was J. F. Porter, Jr., chairman of Kansas City Post-War Economic Development. He talked on industrial relations in the post-war era. Feature of the technical session was the showing of a sound film, entitled "Petroleum and Its Uses."

Lakehead: Technical speaker at the October meeting held at Prince Arthur Hotel, Port Arthur, Ontario, was Pat Burnell. From his previous experiences in tin mining in the Malay Straits, Mr. Burnell gave a most interesting and instructive address on tin dredging and

(Continued on page 224)

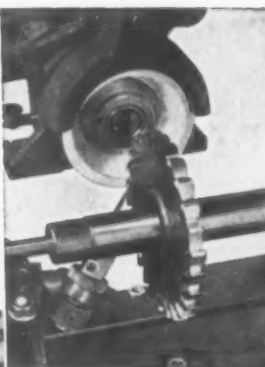
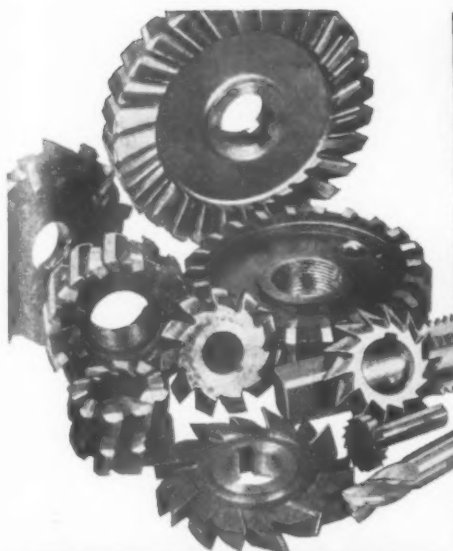


- ① Tools easily honed—kept highly polished—before each shift or with tool in machine—cuts down on carbide-tool grinding.
- ② Keeping tools sharp saves set-up time in changing to new tools, speeds machine output and reduces work spoilage.
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- ④ Supplied in three grades—rough, medium and fine or 100, 150 and 200 grit.

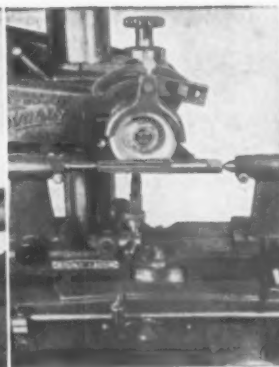
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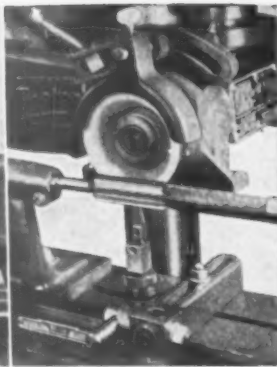
65 COLDEN STREET, NEWARK 4, N. J. formerly Circle Tip Tool Co.



Set-up in grinding a side milling cutter.



Grinding a taper reamer.



Grinding a straight-toothed machine reamer with a cup wheel.

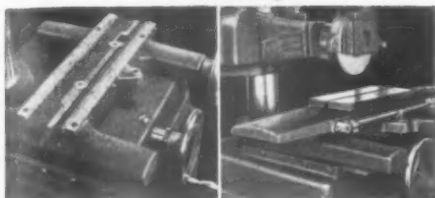
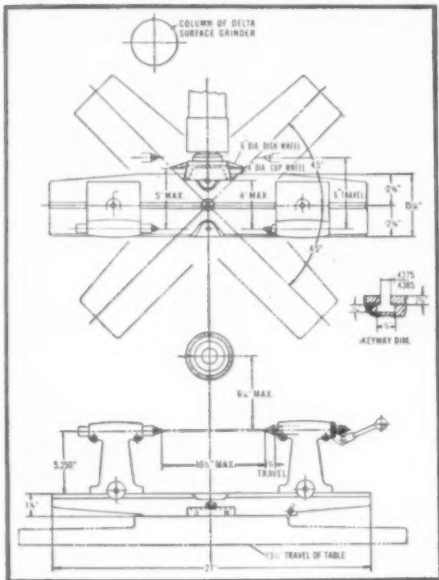
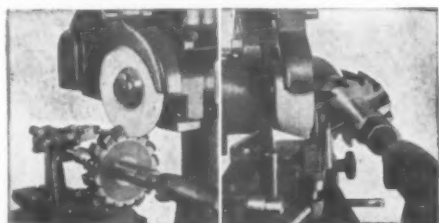


Table rides on accurate ways with adjustable gibs to eliminate all play.

Take-up gib on traverse adjustment. Table traverse is smooth and positive.



Top and side view of the Tool & Cutter Grinder attachment, giving maximum dimensions of work.



Set-up for grinding a radial tooth form milling cutter.

Grinding a spiral mill.

Tool sharpening is simpler, easier, cheaper, and extremely accurate... with the new

Delta Tool and Cutter Grinder

Here is the latest development in Tool & Cutter Grinder design, combining the best features of units of this kind — and its low cost permits its use in all types of shops where accurate grinding must be done.

The new Tool & Cutter Grinder attachment has been added to the famous Delta Toolmaker Surface Grinder (machine may also be used as a surface grinder).

Almost any conceivable angle can be ground. Delta construction features assure perfect alignment and freedom from play, for extreme accuracy over a long, useful life. The machine itself is substantially built (weight over 700 lbs.) and machined to very close tolerances.

For a real find that gives creditable results for years, investigate the modern, goodlooking, efficient machine. Consult your Delta industrial distributor (Delta sells only through distributors) or write for new bulletin.

TEAR OUT AND MAIL COUPON TODAY!

THE DELTA MANUFACTURING CO., 610 N. E. Vienna Ave., Milwaukee 1, Wis.
Please send me your new catalog giving full details on the new Delta Tool & Cutter Grinder and your full line of low-cost machine tools.

Name.....Position.....
Company.....
Address.....
City.....State.....



Specifications

Wheels must have $1\frac{1}{4}$ " hole.

Table surface $5\frac{3}{4} \times 13$ ".

Traverse feed, one graduation is .001".

Maximum vertical adjustment of wheel by means of micrometer is $\frac{3}{8}$ ", each graduation is .0005".

Spindle speeds with a 60 cy 1750 R.P.M. motor are 3200 and 4200 R.P.M.

Price f.o.b. Milwaukee without wheels, motor, or switch... **\$370.00**

Priority required, A-1-A or better, under Restrictions of Limitations Order L-237.

M-6

DELTA
MILWAUKEE
Machine Tools

processing. Also on the program was the showing of the sound film "Panorama of Alloy and Steel."

At the Nov. 4 meeting held at the Royal Edward Hotel, Fort William, Ontario, S. S. Kearns, Northwestern Ontario representative of Atlas Steel Co. presented a motion picture entitled "Vision Fulfilled."

Little Rhody: Ninety-seven members and guests attended the Oct. 25 meeting held at Wannamoisett Country Club, near Rumford. Coffee speaker was A. Bryce Redman, Industrial Glass division of T. C. Wheaton Co. who spoke on "Glass Gages."

Technical speaker was J. T. Bears, staff engineer of Socony-Vacuum Oil Co., who gave a blackboard lecture on "Fluids for Metal Cutting." This was followed by showing of a new color movie by Federal Products Corp. entitled "Dial Gages" and "Indicator Gages." An open forum followed.

Los Angeles: C. K. Andres, field engineer for Skill Tool Enterprises, was technical speaker at the Nov. 11 meeting held at Scully's Cafe. He spoke on "Planning for Production."

Also on the program were strip films entitled "What is Cemented Carbide?" and "Grinding Technique for Carbide Tools." Both films were presented by the Carboloy Company and narrated by Ray D. Mack, carbide engineer of the Pacific Coast branch of that firm. He also presented a display of blanks, and standard and special tool bits.

Milwaukee: W. H. McCoy of Packard Motor Company spoke on "Tooling for Rolls-Royce Engines" at the Oct. 14 meeting held at the Astor Hotel. At the end of Mr. McCoy's talk, members were invited to look over drawings and service manuals on Rolls-Royce engines.

L. J. Radermacher, A.S.T.E. regional director, gave a brief report on the Indianapolis meeting.

Montreal: A. E. Rylander, master mechanic of Midland Steel Co. Detroit, and technical editor of TOOL ENGINEER spoke on "Engineering the Post-War Product" at the Nov. 10 meeting held in the Windsor Hotel.

Also on the program was the showing of a film furnished by the Norton Company on construction of grinding wheels and shown by G. A. Rogers, chairman of the meeting.

New Haven: F. V. Flanders, of Jones & Lamson Machine Co., was principal speaker at the Nov. 11 meeting held at Duncan Hotel.

Mr. Flanders spoke on modern thread grinding practice. Following his address, which was supplemented by an excellent sound movie showing the setting up and operation of modern thread grinders in production, Mr. Flanders was kept busy for 45 minutes answering questions.

Pittsburgh: B. F. Hunter, chief lubrication engineer for Gulf Oil Corp., spoke on lubricants and lubrication at

the Nov. 5 meeting held at Hotel Henry. His talk covered the nature and uses of the various kinds of oils, greases and cutting oils, and general principles for their use.

Potomac: Brig.-Gen. E. E. MacMorland, U.S.A. Office, Chief of Ordnance, War Department, was principal speaker at the Nov. 4 meeting held in the



Featured speaker at the Potomac Chapter's November meeting was Brigadier General E. E. MacMorland, from the Office of Chief of Ordnance. Left to right, Chapter Chairman E. M. Siefert; the General; and A. F. Campbell, Chairman of Chapter Reception Committee.

main ball room of the Mayflower Hotel. He spoke on "Tools in the Combat Zone."

As Chief of the Maintenance Branch, Field Service Division, he has recently returned from a 1200 mile inspection tour of Army Ordnance depots in (Continued on page 226)

ROTOREX UNIVERSAL GRINDER



Cylindrical grinding

Sharpening a Helical Cutter

FOR SHARPENING AND PRODUCTION

PRECISION BUILT to perform two jobs — Production work such as cylindrical and internal grinding and sharpening of all kinds of tools.

The keynote of the Rotorex is simplicity, accuracy and flexibility.

Compact and simple in design with a minimum number of working parts in conjunction with conveniently located controls.

Precision built for sustained accuracy because of good workmanship.

The variety of work it handles is attained by a wide range of attachments for faster set-ups. Selective speed range from 3000 to 6000 RPM.



Internal grinding



DOUGLAS MACHINERY CO., Inc.

158 BROADWAY, NEW YORK, N. Y.



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"STRIPPED PUMPS" SAVE MATERIAL, SPACE AND MONEY . . .



Build the pump directly into the design of your machine and save space, material and money. For this purpose, Tuthill provides positive-displacement, internal-gear rotary pumps in stripped form. Capacities from 1 to 50 g.p.m. for coolant, lubrication and liquid transfer service. Write for Tuthill Stripped Pump bulletin.



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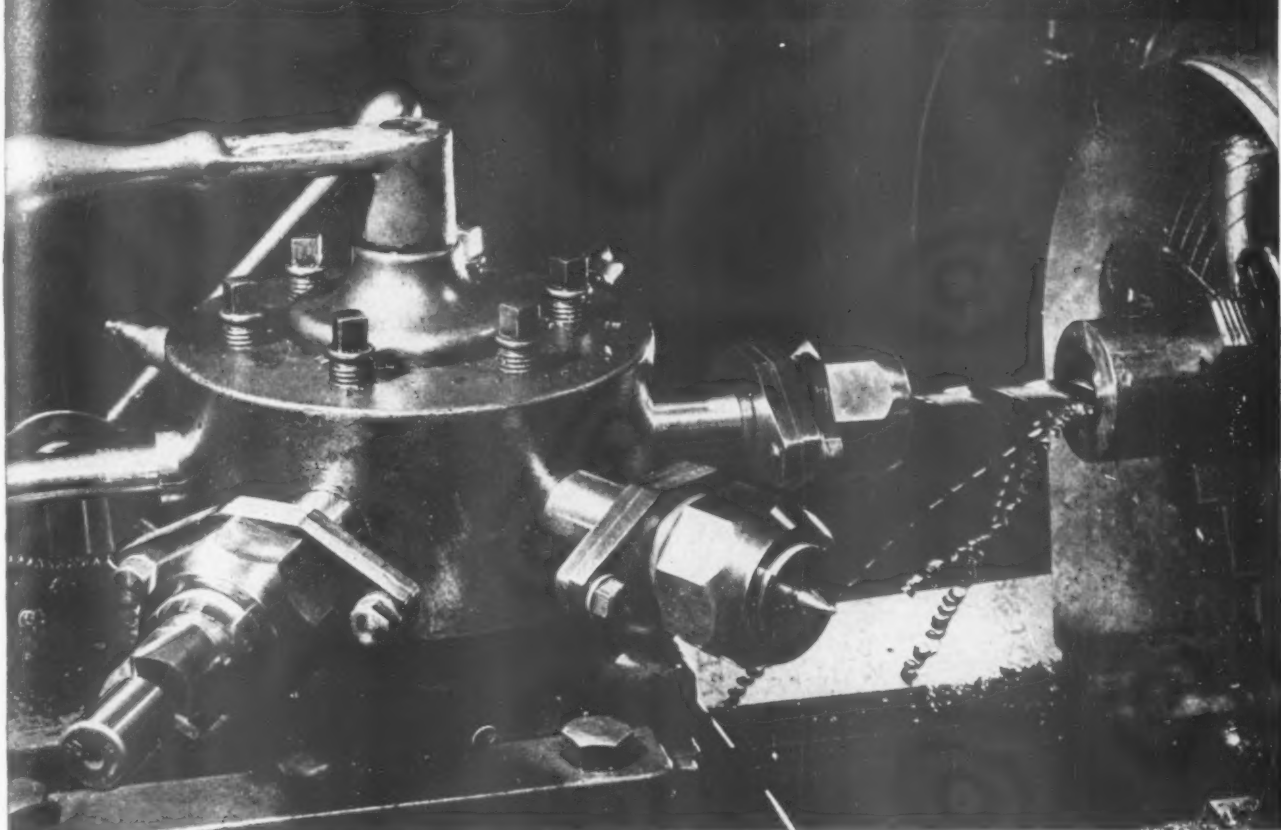


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THE TOOL ENGINEER

ALCO DRILL CHUCK



... FOR ALL SCREW MACHINES — OLD OR NEW

Here is a tool which not only holds drills on screw machines, but reamers, counter bores, center drills, boring tools as well without the use of bushings.

Besides the highest degree of perfection obtained because of the absolute concentricity of the drilling operation with the work, just think of the time that will not be wasted in making special bushings for special size drills nor looking for any one of 250 different sizes of bushings before the actual setting-up of the machine.

Write now for complete catalog
of the ALCO line of tool holders.

ALCO TOOLS

EFFICIENT

THE ALCO TOOL CO., 453 BIRDSEYE ST., BRIDGEPORT, CONN.

Chicago Office: 6219 S. Kenwood Ave., Telephone: Hyde Park 6807 — Detroit Office: 908 Stephenson Bldg.

North Africa and he vividly presented the necessity for simplification and standardization of tools. He cited the confusion resulting from almost endless numbers and names of common tools, importance of getting repairs done quickly, and responsibility of tool engineers in seeing that the most possible along these lines is accomplished.

Rochester: Approximately 500 members and guests attended the joint meeting of the Rochester Chapter of American Society for Metals and the Rochester A.S.T.E. chapter, held at the University of Rochester.

Principal speaker was Dr. H. B. Osborn, research development engineer

of Ohio Crankshaft Co., who outlined "The Tocco Process of Induction Heating" and discussed its contribution to the war effort. He explained the analysis of induction heating, its development, and the part it has played in war production.

Rockford: Maj. Alexander P. de Seversky, author of the best seller "Victory Through Airpower," addressed the Nov. 10 meeting in the West High School auditorium. He stressed need for middle western cities to provide airports if they are to keep step with transportation in the post-war world.

Title of Major deSeversky's address was "Victory through Airpower." He

pointed out that all nations are engaged in a race not only in production but in research as well and are learning to both out-build and out-think each other.

St. Louis: R. S. Drummond, president of National Broach and Machine Co., was principal technical speaker at the October meeting held at Hotel Melbourne.

Mr. Drummond spoke on "Modern Methods of Gear Manufacture." He reviewed recent improvement in design, material, heat treating, machining, production, inspection, and precision finishing of gears.

Schenectady: Approximately 60 members and guests attended the dinner meeting held at Veteran's Hall in Scotia, N. Y. Coffee speaker was National A.S.T.E. President Ray Morris, who briefly reviewed action taken at the semi-annual meeting in Indianapolis. W. L. Morrill, Works Laboratory, General Electric Co., gave a brief outline of the origin of sintered carbide tools as a preface to the technical session.

Principal speaker at the meeting was L. T. Weller, Works Laboratory, General Electric Co. who gave an interesting talk accompanied by slides on use of sintered carbide tools throughout industry, especially relating to the increased cutting effectiveness of machine tools.

South Bend: "Time and Motion Study for Victory" was the title of a talk given by Dr. Marvin E. Mundel, assistant professor of industrial engineering at Purdue University, at the Nov. 9 meeting. An interesting and timely discussion followed Dr. Mundel's talk.

Springfield: The chapter was host to Springfield Chapter of American Society for Metals in the third annual joint meeting of these two societies at the Highland Hotel Oct. 11.

Principal speaker of the evening was H. C. Yaeger, chief metallurgist of the Wright Aeronautical Corp. He gave an interesting talk on heat treating, dealing chiefly with the care of forgings and thin machined castings in heat treating.

Toronto: The Oct. 15 meeting took the form of a "Millionaires' Night" and the success of the affair suggests to other chapters the possibility of using such an occasion as a means of introducing prospects who are interested in the social side of the societies activities.

At the Nov. 12 meeting, principal speaker was J. F. Miller, manager of machine tool division of Ex-Cell-O Corp. He spoke on "Precision Thread Grinding."

The talk was featured by descriptions of wheel dressing guides. A number of women thread grinder operators of Toronto attended the meeting.

Twin States: Principal speaker at the Oct. 13 meeting held in the Masonic Temple in Springfield, Vt. was Hans Kuehni of General Electric Co. He spoke on "Construction and Use of Electric Gages."

He reviewed the principles involved in electric gages and demonstrated
(Continued on page 228)



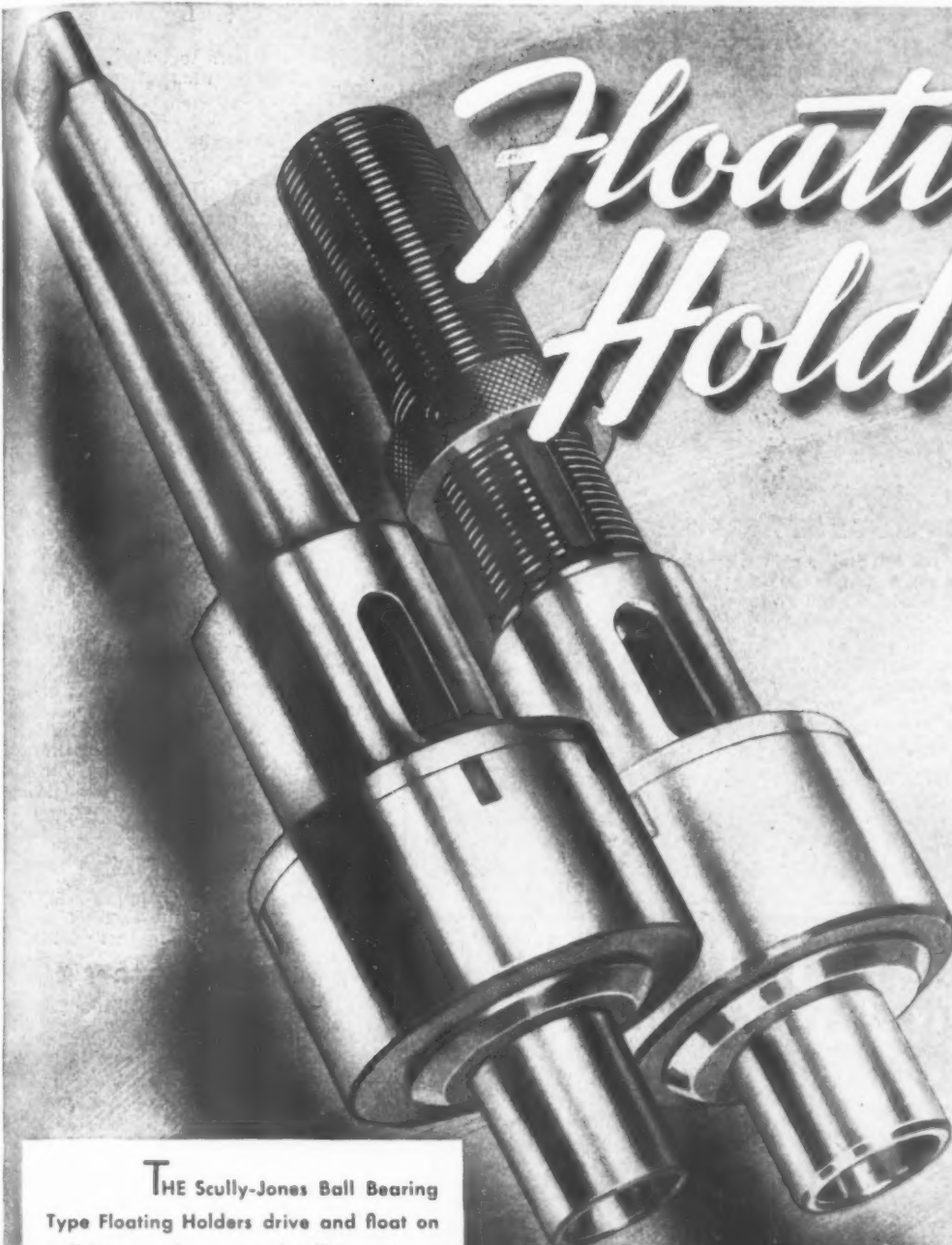
HERE illustrated are two machining tools—one large, the other small, but each is a *great* tool—Kennametal. The cutting edge for the large one is ground on a tip of carbide brazed to the steel shank, that for the small one is ground on a solid round piece of carbide. Each is just as keen as the other for its specific purpose, each equally distinguished for superior performance on jobs within its scope of application. The large tool is for rough turning, the small tool for precision boring.

Here are two extremes in size and purpose, but in between is an array of Kennametal tools suitable for a wide variety of uses—thirty or more different styles, many sizes in each, five available grades of carbide in varying degrees of hardness. Every Kennametal tool, when fitted to its specific job, and correctly used, makes a distinctive contribution to the metal working industry. Maximum machining production, superior finish, accuracy to close tolerances, enduring service—these are outstanding characteristics.

Our new Catalog 43C gives information for selecting, ordering, and maintaining the wide variety of Kennametal tools. Do you have a copy? If so, are you making full use of it?



Floating Holders



THE Scully-Jones Ball Bearing Type Floating Holders drive and float on Ball Bearings for a smooth rolling action... compensating for misalignment between machine spindle and work.

Eliminate scrap from Bell-Mouthed or oversize holes when reaming or precision tapping on AUTOMATIC SCREW MACHINES, LATHES, TURRET LATHES, DRILL PRESSES or MULTIMATIC MACHINES.

Optional Straight, Threaded or Tapered Shanks... Collets with Straight or Tapered holes.



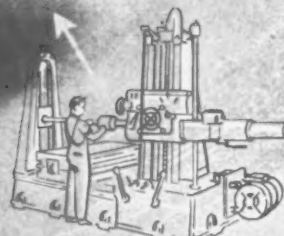
MULTIPLE TAPPING



DRILL PRESSES



TURRET LATHES OR SCREW MACHINES



BORING MILLS

Scully-Jones

AND COMPANY

1901 SOUTH ROCKWELL STREET * CHICAGO, U. S. A.

GET TOMORROW'S WELDING DONE TODAY



...with the help of Ransome Positioners

It is no exaggeration to say you can do just that. For, when Ransome equipment is installed, your welders will no longer have to use their time and energy in shifting the position of their work . . . will no longer be delayed by waiting for crane service.

These versatile positioners put welding into high gear . . . give each welder full control over his or her production . . . provide a downhand position for every weld, with resulting improvement in quality of welds and substantial savings in rods . . . and get out today the work that, with old methods, would still be in your shop tomorrow or next week.

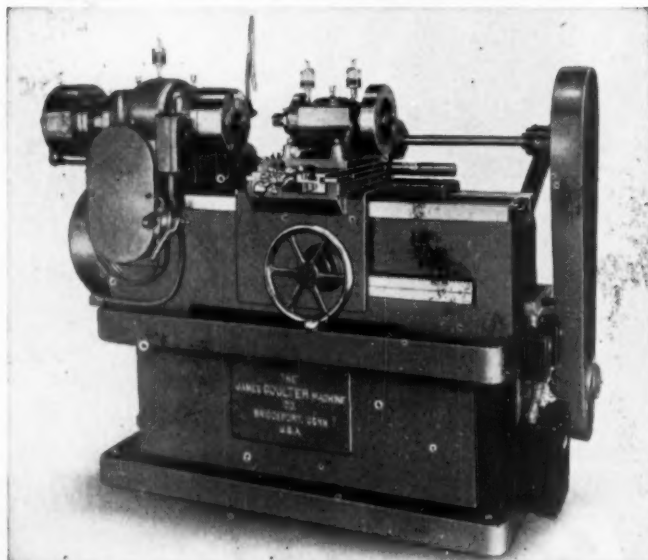
Write for full details, stating the general nature of your welding job.



— RANSOME MACHINERY COMPANY — Danville, New Jersey

Ransome. WELDING POSITIONERS

PRECISION THREAD MILLER FULL AUTOMATIC CONTROL



INTERNAL OR EXTERNAL RIGHT OR LEFT — UP TO 7 INCH DIAMETERS
COMPLETE MOTOR EQUIPMENT — FUTURE TO GO

The James COULTER Machine Co.
BRIDGEPORT • CONNECTICUT • U. S. A.

A. S. T. E. DOINGS

many of the uses to which they could be put. Slides, illustrating the commercial uses of many types of electric gages, accompanied the talk.

At the Nov. 10 meeting, E. M. Seibert, master mechanic of assembly division, Naval Torpedo Station, Alexandria, Va., spoke on "History and Development of the Modern Torpedo."

He outlined various historical events in the course of torpedo development, starting with experiments of Italian engineers in 1581 and continuing through the contributions made up to and including World War I.

Wichita: Walter A. Schlegel, Metallurgist for Carpenter Steel Co., was technical speaker at the Oct. 12 meeting held at Hotel Broadway. Mr. Schlegel used slides to give a highly interesting and instructive talk on making high speed tool steel and its proper heat treatment. Questions from the floor followed his address.

At the Nov. 9 meeting held at Droll's English Grill, Professor C. H. Staples, head of the art department of Wichita University spoke on "Art and Industry."

The chapter is endeavoring to obtain speakers from various parts of the country in order to help tool engineers in this area to keep abreast of modern trends and developments in other sections. Speaker at the February 2 meeting will be Mr. Forbes of Nicholson File Co.

Williamsport: E. V. Flanders, sales engineer of Jones and Lamson Co., spoke on "Thread Grinding" at the technical session of the Oct. 11 meeting held at Covert's Dining Room. His talk was accompanied by complete instructions and demonstrations, shown by movies.

H. M. Huffman, representing Cincinnati Milling and Grinding Machines, Inc., was principal speaker of the Nov. 8 meeting held at Covert's Tearoom. He spoke on cutter grinding. Following his address which was illustrated with slides showing the proper way to grind different cutters, a general discussion on cutters was held and all questions were answered by Mr. Huffman.

WORCESTER: Approximately 125 members and guests attended the Oct. 5 meeting held at Putnam and Thurston's. National President Ray H. Morris outlined plans for the national chapter for the coming year.

A. Bradford Keen, President of Rolled Thread Die Co., presented a talk illustrated with slides on "The Development of Precision Thread Rolling." Also on the program was a sound motion picture entitled "Use of Rubber in Industry" furnished by the B. F. Goodrich Co.

At the November 2 meeting, E. J. Stone, Manufacturing Engineer of Westinghouse Electric and Manufacturing Co., spoke on chromium plating accomplishments at the Westinghouse plant.

Also on the program was a talk on "Electronics at Work," presented by Mr. Ackerman of Westinghouse. He also showed a sound movie giving some of the fundamental principles of electronics and what they accomplish.

THE END

THE TOOL ENGINEER

DECEMBER MEETINGS

Boston: Dec. 9, Schrafft's Restaurant. A. G. Cambria, chief engineer, Lapointe Machine Tool Co., will talk on "Latest Developments on Broaching Machines."

Chicago: Dec. 6, Huyler's Restaurant. Arthur Smith, Jr., production control management division of Dow Chemical Co. will talk on "Light Metals and Post-War Uses." Also, L. R. Dawson of Aluminum Co. of America will talk on "Light Metals."

Cleveland: Dec. 10, Hotel Hollenden. Speaker, V. H. Ericson, Norton Co. Subject, "The Grinding Wheel, Its Use and Care."

Dayton: Dec. 16, Shrine Club. Christmas party. Limited to 100 couples.

Detroit: Dec. 9, Saks Show Bar. Annual Christmas party. Dinner reservations limited to 400. Strictly stag.

Fort Wayne: Dec. 8. C. A. Page, Pratt & Whitney, will talk on "Modern Gaging Methods and Equipment."

Greater New York: Dec. 12, Hotel New Yorker. Speaker will be P. F. Rossman, Wright Aeronautical Corp. He will talk on "Application of Mass Production Methods to Aircraft Manufacture."

Indianapolis: Dec. 2, Hotel Lincoln. Larry W. Lang, National Tool Salvage Co., will talk on "Tool Salvage."

Milwaukee: Dec. 9, Wisconsin Hotel.

New Haven: Dec. 9, Hotel Duncan. J. P. Wilkie, Pratt & Whitney, will talk on "Modern Gaging Practice."

Peoria: Dec. 11, Hotel Jefferson. Annual Ladies' Night. Jan. 4, Hotel Jefferson. H. M. Huffman will discuss cutter sharpening.

Potomac: Dec. 2, Mayflower Hotel. R. Esch or L. R. Twyman of Vickers, Inc., will talk on "Hydraulics in Machine Tool Control and Fixture Operation."

Racine: Racine Plating Co. will sponsor at the December meeting a talk by Axel Lundbye on the Lundbye process of flash chrome plating of cutting tools.

St. Louis: Dec. 17, Norwood Hills Country Club. Christmas party.

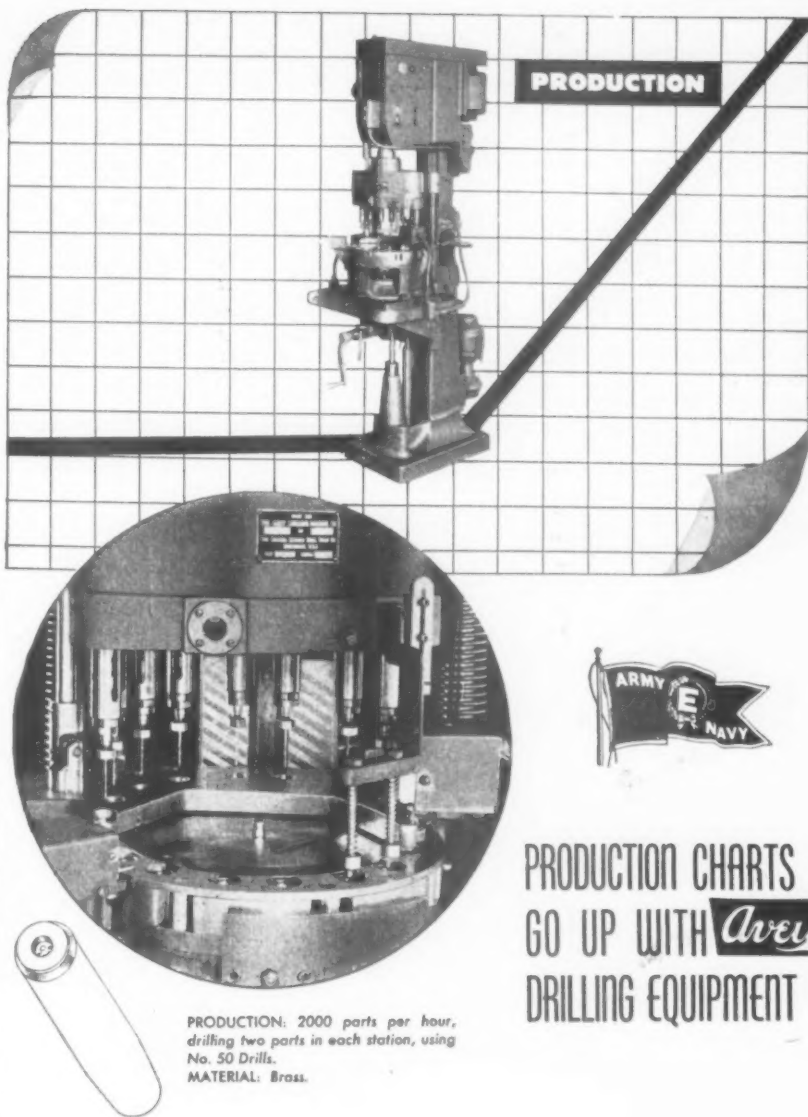
San Diego: Dec. 10, U. S. Grant Hotel. C. A. Moudry, metallurgist for Aluminum Co. of America, will talk on "Heat Treatment of Aluminum Alloys."

South Bend: Dec. 7, Oliver Hotel. C. A. Page, gage engineer for Pratt & Whitney, will discuss "Modern Gaging Methods."

Toledo: Dec. 9, Toledo Yacht Club. Dr. Copeland Smith, N.A.A.M., will give a talk, "Sons of the Pioneers."

Worcester: Dec. 7, Putnam and Thurston's Restaurant. Annual Fun Night.

DECEMBER, 1943



PRODUCTION

PRODUCTION CHARTS GO UP WITH Avey DRILLING EQUIPMENT

PRODUCTION: 2000 parts per hour, drilling two parts in each station, using No. 50 Drills.
MATERIAL: Brass.

Your installation of our Avey Automatic equipment assures you—increased speed in production.

This Standard No. 1 Cam Feed Unit Machine, with Drill Head and Automatic Index fixture, is adaptable to many operations including Drilling, Reaming, Counter Boring and Tapping. Send us prints of your requirements.

THE AVEY DRILLING MACHINE COMPANY
CINCINNATI, OHIO • U. S. A.



• THE PASSING PARADE •

T. M. REG. U. S. PAT. OFF.

THE EVER-CHANGING SCENE IN MASS MANUFACTURING

Curtiss-Wright Corp. announces the appointment of two new vice presidents.

Frank H. Harrison, former manager of manufacturing for the International Harvester Co. and a widely-known figure in Middle Western industry, will be in complete charge of operations for the corporation at Columbus, O. Mr. Harrison, who entered the employ of

International Harvester in 1910 as a toolmaker, had been manager of manufacturing activities since 1941.

E. J. Harrington, coordinator of planning, production and material problems for Lockheed Aircraft Corp., will be located at the New York offices of Curtiss-Wright as a member of the executive manufacturing staff. He is

temporarily assigned to the Columbus factory, however.

Prior to his appointment, he served for several years as special assistant to



F. H. Harrison



E. J. Harrington

the general manager on planning, production, and material control at the Douglas Aircraft Co. He formerly had been associated with Metal Equipment Co., Reo Motor Co., and Graham-Paige Co.

Charles W. Deeds has been elected president and general manager of Niles-Bement-Pond Co. He assumed his new duties Nov. 16, with headquarters in West Hartford.

Mr. Deeds will retain active management of his former company, Chandler-Evans Corp., which recently was acquired by Niles-Bement-Pond. Prior to becoming president of that corporation in 1938, he was associated with the United Aircraft Corp. at East Hartford, and with Pratt & Whitney Aircraft Division.



C. W. Deeds



C. R. Burt

Also announced by the board was the promotion of **Clayton R. Burt**, formerly president and general manager of Niles-Bement-Pond, to chairman of the board of directors.

Mr. Burt is one of the outstanding machine and tool executives of the country and has served as president of the Machine Tool Builders' Assn.

Died: C. H. Williams, founder and honorary chairman of the board of directors of Plomb Tool Co., at Los Angeles on Oct. 31. He was 81 years old.

Mr. Plomb was a major factor in building the Plomb Co. into one of the largest builders of hand tools in the world. He founded the business in his blacksmith shop in Los Angeles in 1907.

(Continued on page 232)

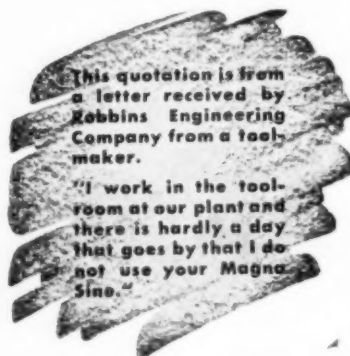


The MAGNA SINE For Angular Grinding Set-ups

Ask any man in the shop about the best way to set up an angular grinding job. If he has ever used a Magna Sine he will tell you that there is no other method of securing accurate angular set-ups so quickly. The Magna Sine uses the sine bar and gage block method of determining angles. Since the Magna Sine itself is a precision tool a most accurate set-up is obtained.

The work is held securely at the turn of a switch. There are no clamps or screws to slip or distort the part. The time required for even the most complicated compound angle set-up is reduced to a matter of minutes.

The Magna Sine is supplied in two sizes in both single and compound angle models. A non-magnetic sine plate for inspection purposes is also available at somewhat lower cost. Write today for complete information.



This quotation is from a letter received by Robbins Engineering Company from a toolmaker.

"I work in the tool-room at our plant and there is hardly a day that goes by that I do not use your Magna Sine."

ROBBINS ENGINEERING COMPANY
318 MIDLAND AVENUE • DETROIT 3, MICHIGAN



In at the finish - "MX" WHEELS



... AND IT'S THE FINISH THAT'S IMPORTANT!

IN at the finish of innumerable industrial operations these days is the versatile "MX" Wheel, introduced by Carborundum, only a little over a year ago. Their function is to remove "disturbed metal" such as the burrs and tool marks which result from grinding, machining, boring and similar operations.

"MX" Wheels are made up of abrasive grains intermingled with cotton fibres and held together with a suitable binder. They are unlike any other abrasive product made. They are free and clean cutting and are used without coolant. They are resilient and have a cushioning effect which makes them tend to

hug the work. Chatter and vibration are reduced. The result is a smooth finish so important in current manufacturing methods.

"MX" Wheels are ideal for breaking corners, removing burrs and polishing grooves and slots. Surrounding surfaces are kept free of abrasive marks. Tolerances are maintained in polishing because of the light stock removal.

Write to Dept. TE, The Carborundum Company, Niagara Falls, N. Y. for literature describing "MX" Wheels and their many uses.

Every hour this war is shortened will save \$12,000,000. The lives it will save are priceless. Let's get it over with—quickly!



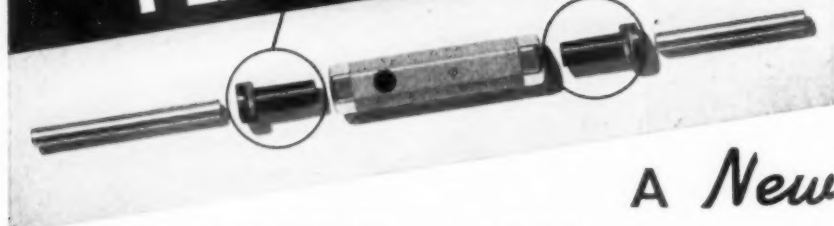
THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

REG. U. S. PAT. OFF.

MANUFACTURERS OF GRINDING WHEELS, COATED ABRASIVES, SUPER REFRACTORIES, HEATING ELEMENTS

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids
(Carborundum and MX are registered trade-marks of and indicate manufacture by The Carborundum Company)

Announcing PLAST-O-LOCK



A New COLLET-TYPE GAUGE that multiplies the life of STANDARD PLUG GAUGES

This new development, PLAST-O-LOCK (pat. applied for), by Turner brings to industry a plastic collet-type gauge that greatly increases the life of standard plug gauges. This PLAST-O-LOCK gauge features a collet of plastic, slotted and tapered to fit into the tapered end of a standard plastic handle. With PLAST-O-LOCK, the holding area of plastic against the gauge's surface does not scratch or burr, thereby allowing use of most of the gauge's length. For example, as the "go" and "no go" ends are worn beyond allowed tolerances they are simply cut off, thus leaving an unused end ready for gauging. To illustrate further, if a boring no deeper than $\frac{1}{8}$ " is being checked, as many as 8 fresh gauging sections may be obtained from one standard length "go" gauge as furnished with Turner's PLAST-O-LOCK. This obviously eliminates the necessity of salvaging used gauges.

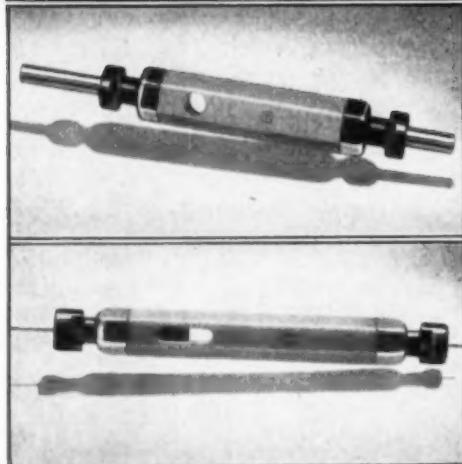
• • •

Turner Gauging members for use with Turner's PLAST-O-LOCK collet-type gauge can be obtained in steel, chrome, tungsten carbide or Nor-Bide. When sending your order specify the type you require.

For a complete description of the PLAST-O-LOCK Gauge, wire or write us on your company stationery.



TURNER GAUGE GRINDING COMPANY
2650 HILTON ROAD • • • • FERRDALE, MICH.



★ Features ★

1. Multiplies the life of the plug gauge.
2. Collet will not mar a lapped or polished surface.
3. Used with plastic handle the gauge has a more sensitive feel in the hands of an inspector.
4. Is easy to make length adjustment because slot is provided for end wrench.
5. PLAST-O-LOCK size range from .050 to .690.

Sizes AVAILABLE

Plug Size Range	Length of "Go" Gauge	Length of "No Go" Gauge
.050 to .099	1 $\frac{1}{2}$	1 $\frac{1}{2}$
.100 to .149	2	1 $\frac{1}{2}$
.150 to .199	2 $\frac{1}{4}$	1 $\frac{3}{4}$
.200 to .249	2 $\frac{1}{2}$	2
.250 to .499	3	2
.500 to .690	3 $\frac{1}{2}$	2 $\frac{1}{2}$

—PASSING PARADE—

Micromatic Hone Corp. has announced that **Lawrence S. Martz** has been named assistant to the president, in which capacity he will continue to direct technical service activities and to co-ordinate the company's human and



D. S. Connor



L. S. Martz

public relations program. He has served the Micromatic organization since 1934 in the engineering, sales engineering, publicity and technical service departments.

Also announced by the company is the appointment of **Don S. Connor** as director of field engineering. He has been associated with the company since 1933, for the past few years as representative in the eastern territory.

Dan Carlson, formerly with Standard Tool Co., has associated with Alexander Jack, formerly of Brown & Sharpe Manufacturing Company, under the firm name of C & J Supply Company with offices at 13368 Strathmoor Ave., Detroit.

Mr. Carlson is an authority on drilling and reaming operations. The concern will handle drills and related tools.

David A. Nelson, has joined the Detroit Broach Co. as vice-president, according to a company announcement. He will be general manager of the West



D. A. Nelson

Coast plant, Beverly Hills, Cal.

Mr. Nelson is well known in the broaching industry and was formerly secretary-treasurer of the Colonial Broach Co. with which he had been associated for the past 18 years.

Frank A. Ross, senior vice-president of Stewart-Warner Corporation, died Nov. 17 at Chicago. He was 60 years old.

Oldest executive in point of service. Mr. Ross came up through the ranks, holding positions as engineer, assistant superintendent, superintendent, and works manager.

(Continued on page 240)

ANOTHER CONVERSION FOR HIGH PRODUCTION

BY A

Buhr

SPECIAL RETOOL



Tooling consists of a fixture for clamping an anti-aircraft part of which one side is a bushing plate. Right hand head has 82-spindles, and Left hand head has 38 spindles with a sliding bushing plate for removal of part from fixture.

All spindles have vertical adjustment for drill adjustment. An oil pump is provided in each head to insure positive lubrication to all ball bearings in the head.

These heads are direct motor driven and mounted on ways and are moved in and out by hydraulic cylinders.

If you have a production problem, let Buhr engineers help you.

BUHR MACHINE TOOL COMPANY,

Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment

833 GREEN STREET
ANN ARBOR, MICHIGAN



HOLDS 3 BIT SIZES IN 4 POSITIONS

**Every AMERICAN TOOL HOLDER
Has this and other advantages**

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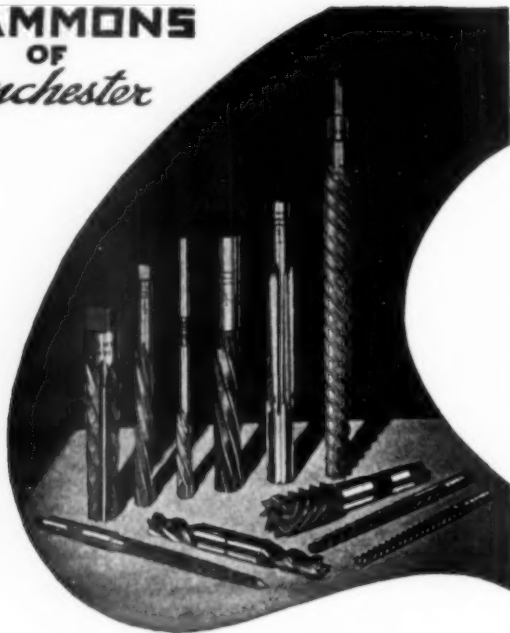
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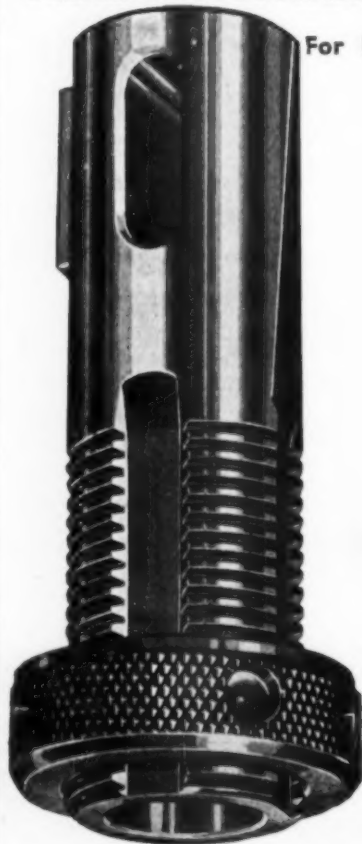
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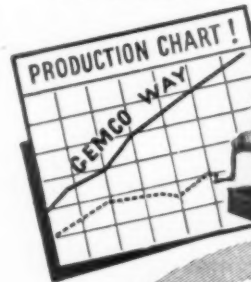
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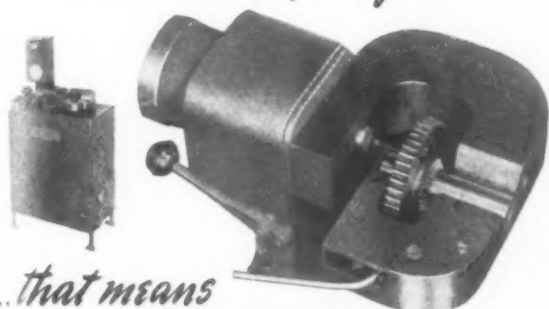
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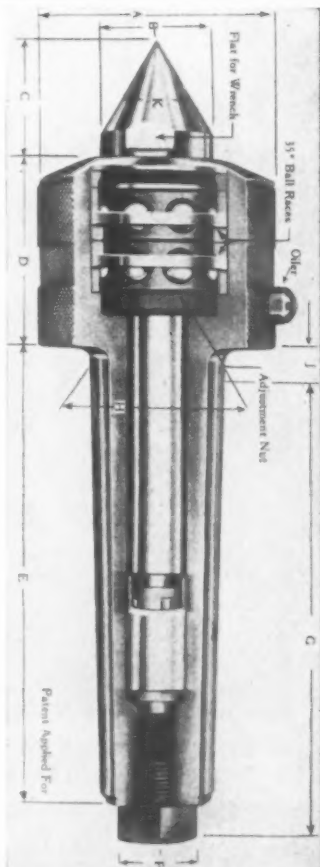


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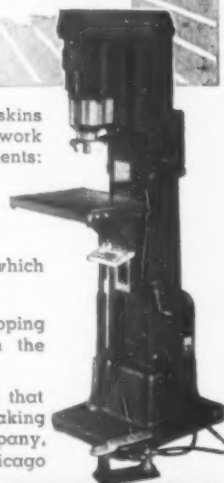
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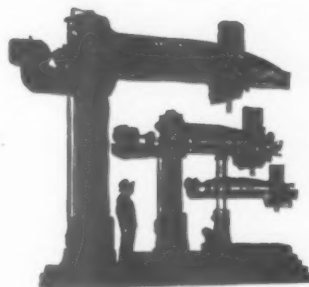
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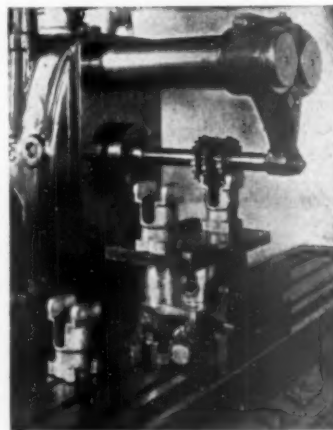
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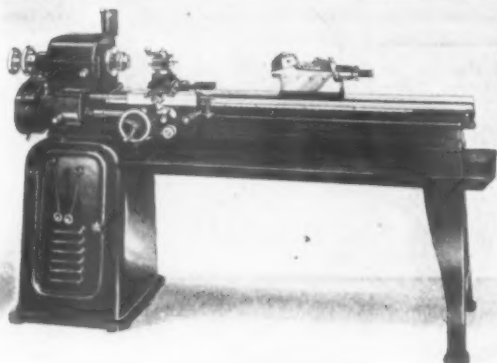
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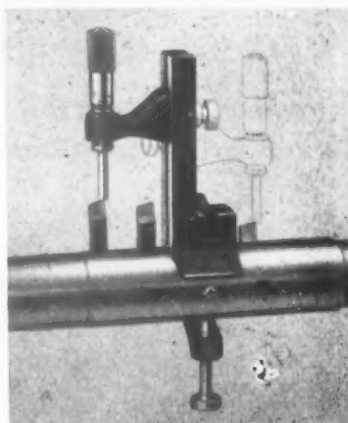


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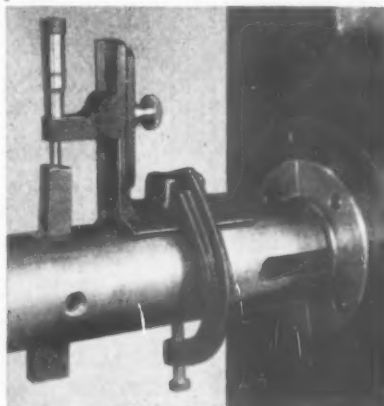
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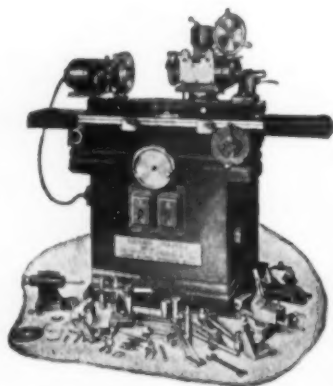
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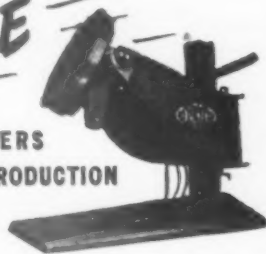
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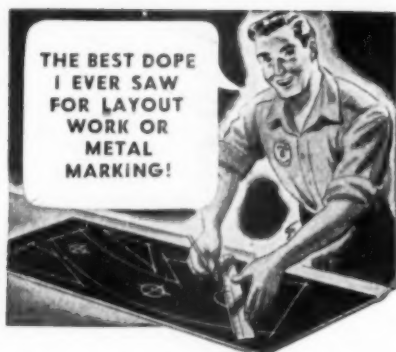


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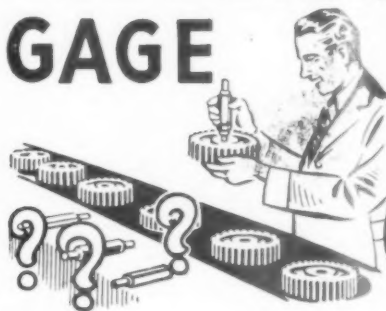
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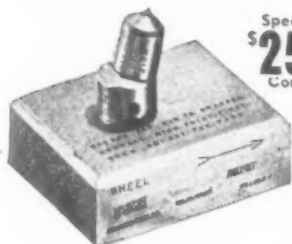
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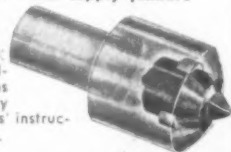
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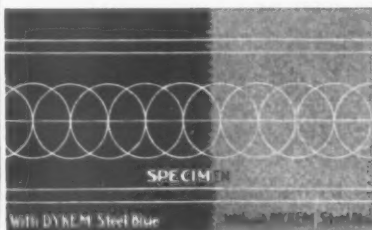
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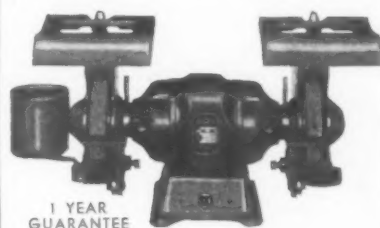
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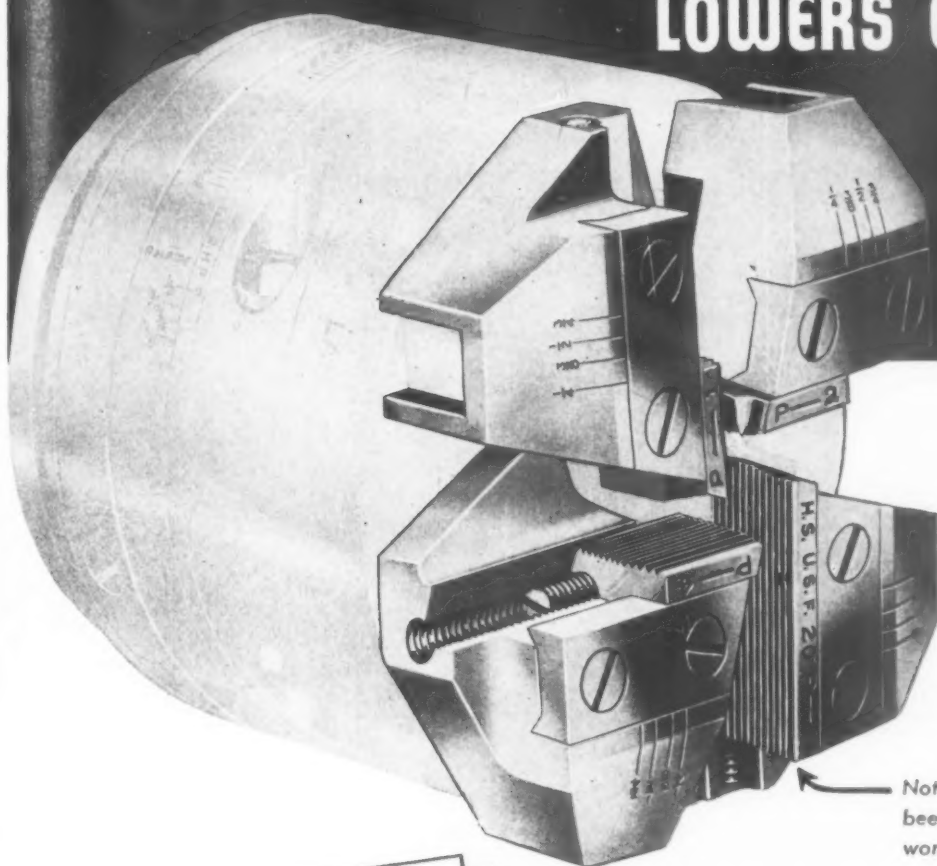
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INTERCHANGEABILITY OF LANDIS CHASERS LOWERS OPERATING COSTS



Note the full length chaser which has been inserted with three practically worn-out chasers to complete the set

12 Features of the LANDIS TANGENTIAL CHASER

- 1-Permanent throat permits close to shoulder threading throughout life of chasers
- 2-Rake angle range covers all machineable materials
- 3-Free cutting condition permits maximum cutting speeds
- 4-Simple grinding operation renews entire cutting edge and leading feature
- 5-Line contact with work lessens friction and minimizes thread distortion
- 6-Leading feature insures thread of accurate lead
- 7-Lateral absorption of cutting strain reduces vibration and chaser breakage
- 8-Right and lefthand threading feature reduces chaser equipment
- 9-Standard chasers thread all diameters with proper chaser holders
- 10-Interchangeability of chasers lowers operating cost
- 11-Chaser length provides exceptionally long life and low tool cost
- 12-Permanent throat gives equal distribution of cut

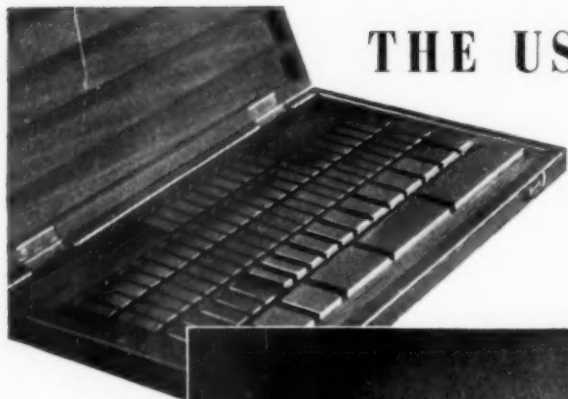
EACH LANDIS CHASER IS AN INDEPENDENT UNIT

Whenever a Landis chaser is worn or damaged it can be reground or replaced without affecting the remaining chasers of the set. Each chaser is entirely independent of the other. New ones are substituted as needed, as long as the pitch, thread form, and throat remain the same, thereby insuring low operating cost.

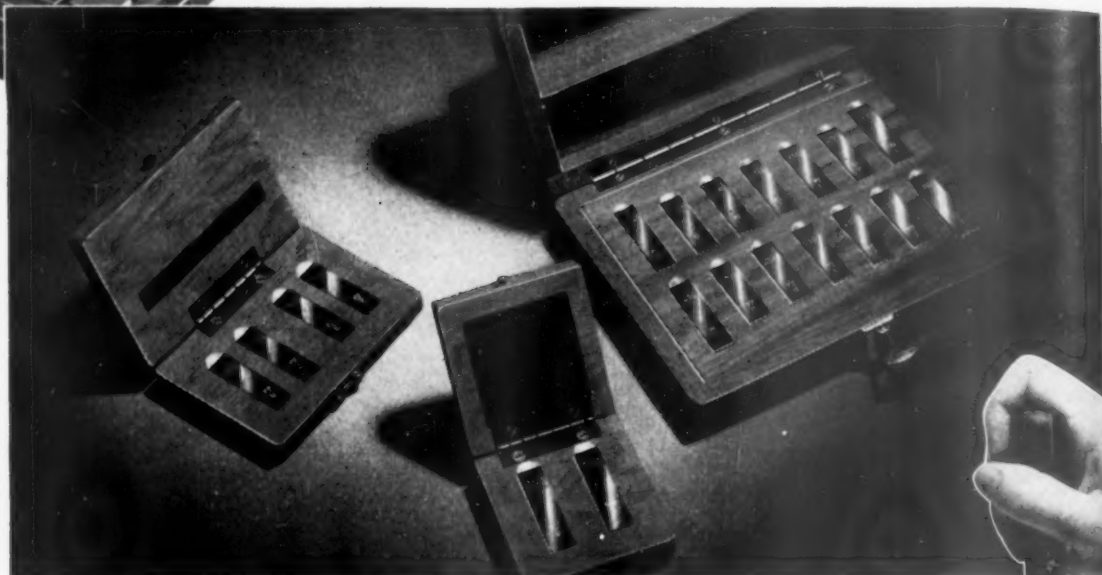
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THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS



THE USEFUL, ACCURATE LIFE
of
Standard Gage Block Sets
Increased Many Times Over



WHEN

Carblox

CEMENTED-CARBIDE GAGE BLOCKS ARE USED
AS END BLOCKS IN BUILD-UPS

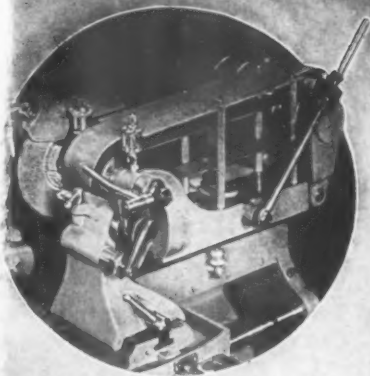
The greatest wear factor in the use of any gage blocks is caused by abrasion on the ends of the build-up. Carblox used on each end of a build-up will act as protective anvils and prevent wear on the less wear-resistant steel blocks.

Carblox, used to supplement standard sets of steel or chrome plated gage blocks will greatly increase the usable, accurate life of those sets now in use in your plant. In addition, the customary necessity of checking blocks can be largely eliminated, and scrap or rejections resulting from the use of worn gage blocks will be reduced to a minimum. Write for full information.

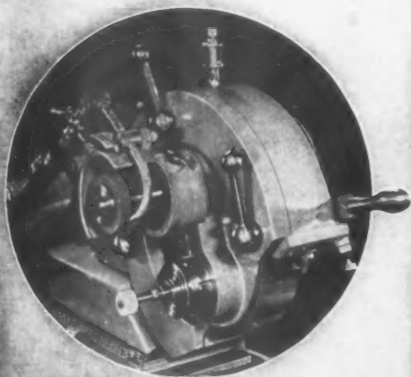


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LINCOLN PARK, MICHIGAN



**External Spindle and
Tailstock**



**Internal and External
Spindles in Turret**

SPECIFICATIONS

Grinding cap., hole dia. up to 3"
 Grinding cap., outside dia. ... up to 3"
 Automatic table travel
 Standard 1/4" to 2"
 Special 1/2" to 4"
 Hand table travel 11"
 Swing over table 8"
 Center distance 8"
 Workhead swivel 90°
 Table swivel 5°
 Cross feed graduations
 Standard0005"
 Special0001"
 Travel of cross slide 1 3/4"
 Collet capacity 7/8"
 Step chuck capacity6"
 Jaw chuck capacity6"
 Workhead spindle speeds
 200, 375, 600 r.p.m.
 Grinding spindle speeds:
 Standard int. 21000 and 25000 r.p.m.
 External 3800 r.p.m.
 Net weight with motors 1750 lbs.



**For Further Description
Write for Bulletin 104**

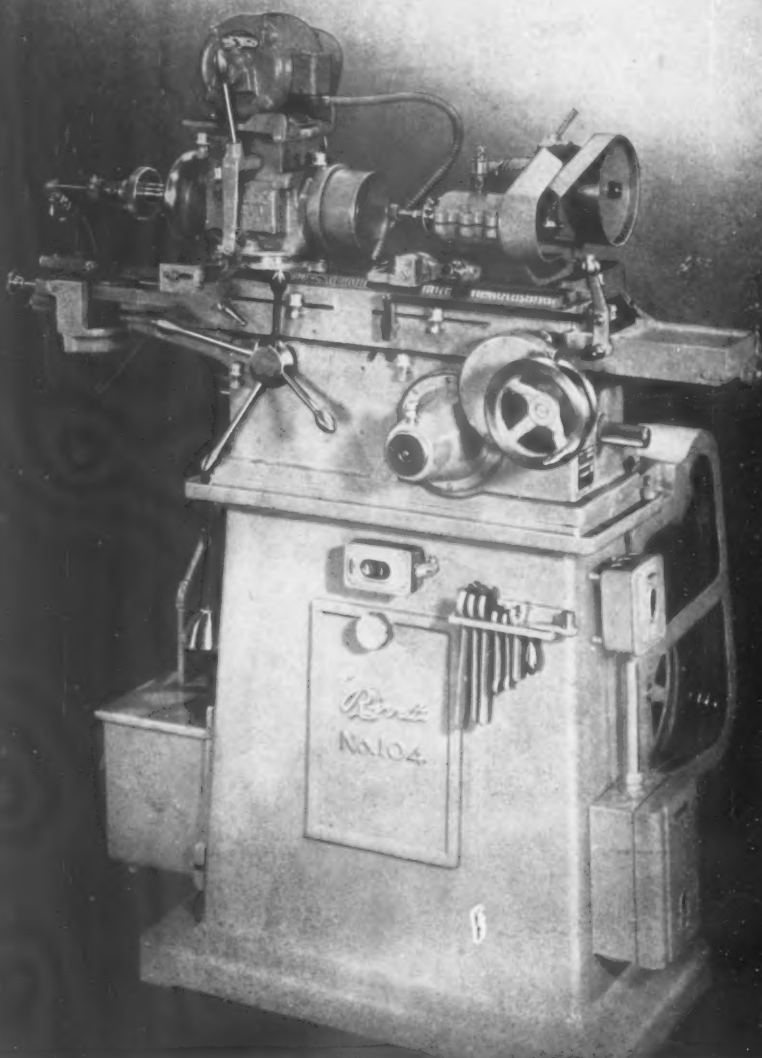
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**For Small Hole, Cylindrical and
Concentric Grinding**

The Rivett No. 104 is a simple, accurate grinder suitable for die and tool making as well as precision manufacturing. Its ease of set-up and operation and its selective spindles make it an efficient machine for internal and external grinding. The internal or external grinding spindle bracket may be selectively mounted on cross slide as desired. For special work requiring concentric grinding of internal and external surfaces at one chucking, turret carrying both internal and external spindles may be used.

Work may be held in collet, step chuck, jaw chuck or fixture or on centers when using external spindle with tailstock. Power table reciprocation has three speeds from 54 to 126 passes per minute. Length of table travel is infinitely adjustable between 1/4" and 2" or 1/2" and 4" depending on range selected.



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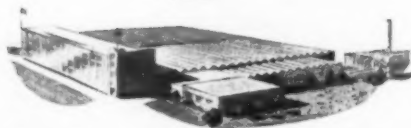
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